Electrical Review

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Selling Violet-Ray Apparatus in Electrical Stores

Electrotherapeutical Appliances Increase Profits of Electrical Contractor-Dealer by Enlarging Field, Reducing Turnover Period and Spreading Overhead Expense Over Greater Variety of Stock

By WILLIAM B. EASTWOOD

Every contractor-dealer who looks forward to a successful and growing future is on the alert for methods and merchandise that will hold his present trade and attract new customers. Despite the uncertainty of the business outlook at the dawn of the new year, his reason and past experience tells the dealer that he is fairly safe in keeping up his stock of household appliances, such as clothes washers, ironers, vacuum cleaners, dishwashers, sewing machines, flatirons, percolators, toasters, grills, lighting fixtures, lamps, fittings, etc., because these articles have become standard necessities.

What, then, can be added to his stock that will stimulate buying, induce the attention of new customers, shorten his periods of turnover and reduce his overhead expenses by spreading them over a more diversified stock?

Recently not a few contractor-dealers have found a satisfactory and profitable solution to the problem of trade stimulation by the addition to their stocks of a line of household electrotherapeutical apparatus, including such appliances as electric vibrators, violet-ray generators, small high-frequency coils, faradic coils and small batteries, hair dryers, heating pads, immersion heaters, curling irons and wavers, electric bath cabinets, etc.

In some instances the electrotherapeutical devices have been featured in window displays and

Special Display of "Violetta" Outfits in Window of Esco Electric Supply Co., New York City, That Sold Several Hundred Violet-Ray Appliances Daily.

arranged in a special department in or adjoining a rest room, with a lady demonstrator in attendance. Special advertisements and invitational circular letters were employed to attract women customers. In each case of this kind the venture

Showcase of Electrotherapeutic Apparatus in Appliance Department of Walter A. Hill & Co., Baltimore, Md.

has proved a profitable success, not only in the sale of these particular devices, but in stimulating trade in other standard appliances and fixtures carried by the dealer.

Selection of Electrotherapeutic Devices Suitable for Retail.

Not all electrotherapeutic apparatus made by the various manufacturers who specialize in that line may be sold to the general public. Much of it, particularly that of a more elaborate nature, is especially made for use by physicians, dentists and in hospitals by trained attendants. But there are a number of devices under this head which may be manipulated with perfect safety by anyone, and which are designed to be connected to any receptacle or lamp socket in the home. Some of these devices are also supplied with batteries for use where the home is not wired for electricity.

Electrotherapeutic devices such as violet-rays, etc., have their chief appeal to womankind in their aid to health, vitality and beauty. There is scarcely a home in any neighborhood or community that does not contain at least one prospective customer for these devices in the housewife or her daughter. It is not an overdrawn statement to say that many maids and servants find them within their means, and take much pride in the possession of one or more of these devices. Men as well as women are finding relief from petty ailments, mental and physical fatigue, nervousness, etc., in the use of the violet-ray or vibrator.

Selection by the contractor-dealer of such of these health and beauty devices as he sees fit to carry is made easy by the comprehensive literature furnished by the manufacturer. This literature also gives the dealer a very good idea of the superficial knowledge he and his salesmen will require in order to successfully sell the appliances. The dealer will find it profitable to instruct each purchaser of apparatus in the few simple methods for care of the device to insure the best and most durable service.

One of the features which will appeal to the electrical dealer who is just entering this new field lies in the rapid turnover which he will be able to make. The articles are comparatively inexpensive and it does not require a large investment to carry them in stock.

Electrical Stores Should Properly Handle Electrotherapeutical Apparatus.

Electrical devices for improvement of health and beauty, like many other electrical appliances, have found their way into department, drug and other stores, much to the disgust and indignation of many electrical contractor-dealers. At a recent meeting of the Wisconsin State Association of Electrical Contractors and Dealers a member propounded the question, "Why are so many electrical appliances sold in stores other than those of electrical dealers?"

From the discussion of the above question there was evolved what appears to be an adequate and satisfactory answer. It was generally conceded that the handling of an electrical appliance by department and drug stores was most flattering to the saleability of that appliance because drug and department stores will not handle articles for which there is not a substantial universal demand. It was decided that the sale of appliances by such stores also served to popularize them in a greater degree and to make it easier and more profitable for the electrical dealer to handle

Case of Electrotherapeutic Apparatus Convenient to Resting Place in Fixture Department of Hill's Store.

by advertising the fact that he could give greater satisfaction to the purchaser because of the electrical service he alone was able to supply with the device.

As a matter of fact, those electrical dealers who are now handling electrotherapeutic apparatus—and the number is increasing daily—are doing so in competition with department and drug stores, and are making a success of it. Many report that they find an even broader field for the little health and beauty devices than for the regular household labor-saving appliances. As the electrical contractor-dealers develop their business to a higher degree of electrical retail service to the public, they will become more exclusively the merchandisers of things electrical and the public will learn to buy all electrical appliances from electrical dealers.

Special Window Displays, Advertisements and Store Arrangements.

Reference to one or more of the illustrations with this article gives a fair indication of the

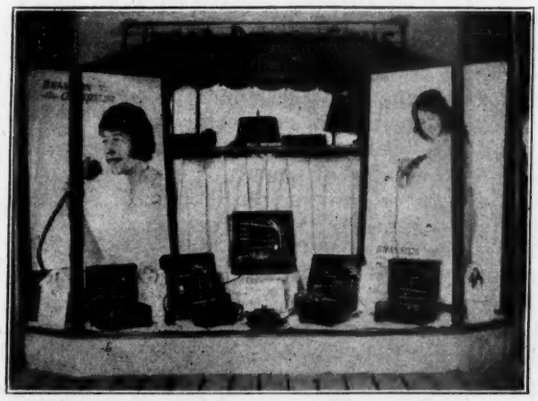
adaptability of violet-ray and other apparatus to special window displays of an electrical store. It is important, of course, that the showcards briefly but clearly indicate the advantages to be obtained from the use of the devices. Most dealers also feature the prices in the window display. This they do because many persons are still unfamiliar with the use of the devices and might consider them a high-priced luxury without making further investigation did they not see the price tag.

Newspaper advertisements featuring the sale of electrotherapeutic appliances in an electrical store will naturally make their appeal from the standpoint of health and beauty and the simplicity of manipulation or application of the devices in the hands of young or old in the privacy of their own home. An advertisement of this nature, if given the requisite "punch," need not necessarily occupy a large space in a newspaper.

Electrical dealers who have a mailing list of old and prospective customers—and all progressive dealers have them—may carry out the same advertising ideas in circulars, circular letters and invitational letters asking the recipient to call at the store on a certain date for a special demonstration. Few women can resist an opportunity to experience the soothing and beneficial effects of a violet-ray, vibrator, hair dryer, electric comb or curling iron and waver.

"Buy your electric appliances in our electric shop and obtain electric service," read a recent advertisement of an electrical contractor-dealer. One of the readers of that advertisement came into the store and asked, "Just what do you mean by saying you give electric service?" The dealer replied, "Just what we say; we furnish electric service with our appliances because we are electricians as well as dealers, and we are therefore able to instruct our customers as to the manner of handling and caring for them so they will last longer and give better service. We are also in a position to make them good if anything goes wrong." "I see," said the stranger. "Hereafter I will buy my electrical goods from an electrical dealer." This system applies equally well to the health and beauty devices and offsets the bogey of department and drugstore competition.

Displays of these appliances in the store should back up the newspaper and circular advertisements and the show-window display. The devices lend themselves to display among other small appliances in glass-inclosed wall cabinets and showcase, and some of them may be thus distributed to advantage, but it is being found more profitable to establish a special department for them. This special department naturally suggests proximity to or within a cozy corner or rest room set aside for women customers. A glass showcase may contain as assortment of the apparatus and several samples may be arranged on a table. Those on the table should be equipped with a cord for connecting with the electric circuit by means of a floor receptacle or wall receptacle if the table is near the wall. They are then convenient for demonstration, preferably by a lady attendant who is thoroughly familiar with their use and is a competent saleslady.



Window Display of Violet-Ray Apparatus in Electrical Retail Store, Toronto, Ont.

Another Toronto Electrical Store Where Trade in Electrotherapeutic Devices Is Brisk.

Appeal of Women Demonstrators and Saleslades to Women Customers.

It has been found that competent women who can demonstrate and sell electrotherapeutic apparatus find the greatest favor with women customers. There are some men who are equally successful with the ladies, but they are rare. While every woman is desirous of improving her beauty and finding a handy means of alleviating her small aches and pains, she is frequently diffident in the presence of a salesman whereas she will become very intimate with the tactful saleslady.

It is not so very difficult for a woman to equip herself with electrical knowledge of the health and beauty devices and she is intuitively adapted to understand and sell the service of the devices. The woman demonstrator should be instructed to explain the necessity of proper care of the apparatus to the customer so that it will give long and faithful service. This includes the caution to oil the appliance but to avoid using too much oil, and to implicitly follow the instructions which accompany each device. Every appliance that leaves the factory is fully tested to insure perfect operation.

What Those Who Handle Violet-Ray Devices Have to Say About Them.

"Handling and selling the violet-ray apparatus is almost a new experience to us," writes Walter E. Hill, of Walter E. Hill & Co., dealer in lighting fixtures and electrical supplies, Baltimore, "as we have only been in this field a few months. The success we have had up to the present time is

due, we feel sure, to the extensive advertising we have been doing along this line. To the question of whether the electrical dealer knows all there is to know about selling violet-rays and vibrators we would answer, 'No,' for there is always much to be learned about any appliance he may handle. We may also say there are unlimited sales methods with which he must familiarize himself, and every prospective customer will give him something new in this line. Our experience has been to first qualify the customer and then talk up the product. The result in two-thirds of the cases will be that the customer will buy, for by qualifying himself before you actually try to sell, he has been made to see the real value, not only of the violet-ray generator, but of any other electrotherapeutic apparatus. We feel that the field is unlimited and that every man, woman and child is a prospective customer for the purchase of the violet-ray machine. We believe dealers are beginning to realize the new field that is before them and waiting for them to take advantage of it."

An electrical dealer in Amarillo, Tex., writes the following to one manufacturer under recent date: "Herewith is an additional order for 'Violetta' outfits. We have had the *Tribune* send you samples of newspaper advertising we have been carrying and which has sold for us nearly all the outfits we have previously ordered, and brought many more inquiries which we believe will result in future sales. We believe it pays to advertise and if you have any newspaper cuts and lantern slides or other printed matter we would be glad to have it."

In Canada one electrical dealer sold a number of violet-ray appliances to the Dominion Rubber System, Ltd., Ontario, the manager of which writes the dealer as follows: "The violet-ray machines which we purchased from you last year

Electrical Store of Walter A. Hill, Baltimore, Successful Retailer of Violet-Ray Generators.

have been very satisfactory. The reports we have from our different branch factories are to the effect that these machines are very useful in our hospitals. We feel quite sure they have saved us many dollars in keeping our employes at work. In cases of headache they are treated in a few minutes, whereas they were formerly off duty for the entire day."

Manufacturers of electrotherapeutic apparatus are prepared to assist the electrical contractor-dealer in a most liberal manner in the introduction and sale of their devices. They will not only give valuable counsel, but will assist in the preparation of newspaper advertisements, form letters, circulars and pamphlets. They will furnish designs for window displays and advise regarding the arrangement of displays in the store. They will make it so easy for the dealer to sell the devices that he will wonder why he did not handle them long ago.

ELECTRICAL GOODS IMPORTED INTO SOUTH AFRICA.

Despite the relatively small white population in South Africa large quantities of electrical goods are purchased, chiefly because of the requirements at the mines. Figures recently compiled show that in 1919 South Africa imported more than $5,000,000 worth of electrical and allied material. Before the war Germany was an important factor in the market, but since the beginning of hostilities in 1914 substantial gains have been made by the United States. With the mining companies of the Transvaal buying about $68,000,000 worth of machinery, supplies, etc., in 1918, all the important business houses in the country have establishments in Johannesburg and carry heavy stocks. At the present time one American electrical manufacturer has established a branch house in that city.

AIMS OF S. E. D. SET FORTH IN NEW BOOKLET.

"Achievements, Activities, Aims," is the title of a 32-page booklet just issued from the executive offices of the Society for Electrical Development, 522 Fifth avenue, New York City. The booklet describes in an interesting manner how an important industry representing an aggregate investment of $3,000,000,000 is pulling together to secure greater appreciation of the service it is rendering to the American public. The Society for Electrical Development unites effectively all the branches of this many-sided industry and is equipped most thoroughly to carry out its aims and purposes. What the society has accomplished through its great campaigns and its all-the-year round activities is set down in the booklet.

VALUE OF THRIFT POINTED OUT IN BYLLESBY BOOKLET.

A new booklet bearing the title, "Save With a Smile," is being distributed by H. M. Byllesby & Co., Chicago. It is designated to create a new interest in thrift and systematic saving. Every page of the booklet contains one or more quotations on the value of saving or thrift from successful men or leaders of thought. The first chapter is entitled, "Why We Should Save." Others are "Thrift," "Compound Interest," "Investment," "An Easy Way to Save and Invest," "How to Judge an Investment," "Why This Is the Greatest of All Times to Save," and a final chapter on "Byllesby Sponsored Securities." A feature of the booklet is a compilation showing how rapidly wealth accumulates when certain sums are saved regularly and invested at 7%.

Making Electrical Contracting More Profitable

Indifference and Selfishness to Be Eliminated and Contractor Who Cuts Prices Won Over by Organization—Address at Meeting of Indiana Association of Electrical Contractors and Dealers

By A. L. SWANSON

Electrical Contractor, Evansville, Ind.

"We can, if we will" should be the slogan of every electrical contractor who wishes to become successful in his business, who wants to elevate and dignify his calling in the eyes of the public and who earnestly desires to overcome that bane of the electrical contracting business—evil competition. If each contractor would keep repeating to himself "We can, if we will" 25 times or more a day until he believes it, he is sure to obtain his desired goal. He who takes this slogan to himself will develop the determination to be a clean-cut, honorable business man, and will help his competitor to be the same. He will get out of the rut in which he is now working under so much handicap, and success will mark his determination to take only such contracts as will pay a profit.

The copy of the estimate of the "Blank Electric Co." for wiring and installing lighting in the establishment of the "Blank Merchandising Co.," accompanying this article, while not an actual bid for the work of an existing firm, represents fairly well the type of electrical estimating very much in vogue not so many years ago. Thanks to organization and the consequent higher development of the electrical industry this type of contractor is fast becoming extinct. Those who still remain must be won over by the persistent application of the slogan, "We can, if we will."

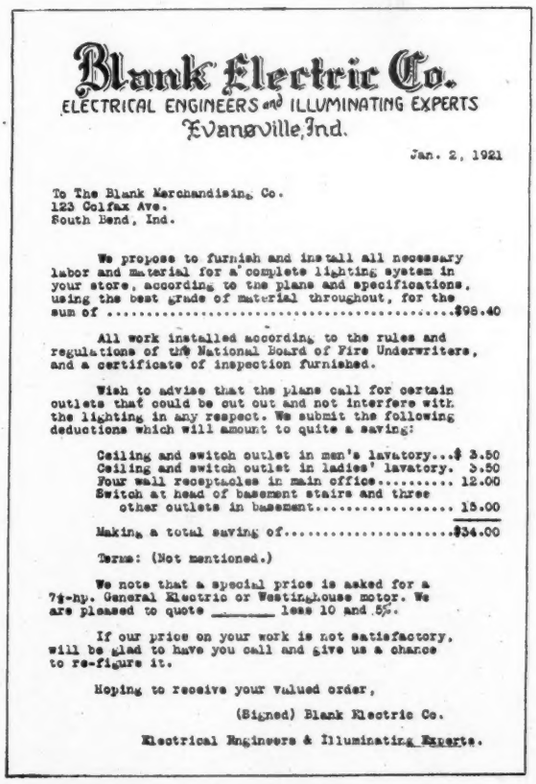
In one of the instances which inspired this typical "cut-throat" estimate was that of a firm which received nine bids for a somewhat similar lighting system, the figures of which ranged from $42.30 to $360. After three weeks of careful consideration the firm in question decided to buy the material through a salesman who travels for a Chicago fixture jobber, and to borrow a union lineman from the local central-station company to install the material after working hours. Prior to this action, however, and because the wide variation in the bids had caused them to become suspicious of electrical installation, the heads of the firm decided they had better have gas installed. This decision was revised when it was found that the gas company was so busy it couldn't get to the job for nine months.

Indifference and Selfishness Interfere With Contracting Profits.

Electrical contracting is coming into its own now more than at any other period of the electrical industry. It is a business that is now being taken seriously by the public, and the individual contractors are coming to realize the real responsibility of their chosen work. Organization and exchange of ideas has produced a spirit of liberality and tendency toward co-operation with each other and with other branches of the industry that is bound to benefit each individual who participates. But conditions in the contracting field are still a long way from satisfactory.

There are two important reasons why adequate profit is not realized from electrical contracting today. These two reasons that are retarding the success of the contractor are indifference and selfishness. Where the electrical contractor is unsuccessful and considers himself lucky if he comes out even on many of his jobs, it may safely be said that he is indifferent to the point of laziness because he has not equipped himself with easily obtainable knowledge for making proper estimates and keeping his accounts.

To overcome this indifference the contractor must come to a full realization of the necessity



Blank Electric Co.
ELECTRICAL ENGINEERS and ILLUMINATING EXPERTS
Evansville, Ind.

Jan. 2, 1921

To The Blank Merchandising Co.
123 Colfax Ave.
South Bend, Ind.

We propose to furnish and install all necessary labor and material for a complete lighting system in your store, according to the plans and specifications, using the best grade of material throughout, for the sum of $98.40

All work installed according to the rules and regulations of the National Board of Fire Underwriters, and a certificate of inspection furnished.

Wish to advise that the plans call for certain outlets that could be cut out and not interfere with the lighting in any respect. We submit the following deductions which will amount to quite a saving:

Ceiling and switch outlet in men's lavatory...	$ 3.50
Ceiling and switch outlet in ladies' lavatory.	3.50
Four wall receptacles in main office.....	12.00
Switch at head of basement stairs and three other outlets in basement.....	15.00
Making a total saving of.....	$34.00

Terms: (Not mentioned.)

We note that a special price is asked for a 7½-hp. General Electric or Westinghouse motor. We are pleased to quote _____ less 10 and 5%.

If our price on your work is not satisfactory, will be glad to have you call and give us a chance to re-figure it.

Hoping to receive your valued order,

(Signed) Blank Electric Co.

Electrical Engineers & Illuminating Experts.

Type of Electrical Estimate Fast Disappearing Before Progress of Organization.

of first putting his own house in order. An accounting system should be installed at once, no matter whether the firm is composed of a single man or a large company. Excellent accounting systems for large or small firms are now obtainable from the National Association of Electrical Contractors and Dealers. The contractor needs an accounting system in order to tell exactly the amount of his overhead expense so that it can be added to the cost of labor and material in figuring the estimate for a job. Then he should tack onto that estimate an additional figure for "profit." Not only must he add an adequate amount to his estimate for profit, but he must possess himself of sufficient determination to stick to his figures despite friendship for the patron or injurious competition of other contractors. "We can, if we will."

The day is past when any single contractor can get all the business in his community. That contractor is lazy or indifferent who has not organized his business so that he can personally have time to take advantage of some of the undeveloped business which the manufacturers and jobbers are spending their good money to create through national advertising. Usually this newly created business is free from competition. This determination to do our will means to work in harmony with the jobber, the central-station company and the manufacturer.

As a matter of fact the public wants to obtain electric service faster than contractors are in a position to make the installations. The reason some contractors are not in a position to serve them is because they haven't the time. The reason they haven't the time is because they have not organized their business on a profitable basis so they can take the time from detail work to study the needs of the manufacturing plants, business houses and residences, and so they can sell them a real electrical job in an intelligent manner.

It is laziness or indifference on the part of the contractor who does not at once collect for the job even after he has installed it without profit. How many contractors take the trouble to look up their customers' financial standing to be absolutely sure they are able to pay, then write into the contract, "Terms: Cash on completion of the job," and insist on getting it? The lazy or indifferent conractor is one who fails to accumulate information pertaining to his business so that he can intelligently study it from the various angles and determine the most desirable and profitable method of adapting to his own particular ability and organization, and so he can specialize on it and develop a real reputation for service. He is too busy spending his time competing.

Evil Competition May Be Eliminated by Unselfish Co-operation.

Selfishness was the second reason given for the non-success of the electrical contractor. If one was to ask some contractors how much of their time they were giving to the less experienced competitor, the answer would almost certainly contain such phrases as "He's a crook," "no hopes of winning him over; tried it once," "he is a liar," "he cuts prices," "will not stick to his agreements," "can't be trusted," "he knows it all," "can't last long—about busted now," "you can't tell him anything," "he takes work below cost," "too dirty to associate with," "he never did anything for me," and "he's not on the square."

Just a moment. The object of these diatribes is still with us, although in gradually decreasing numbers. If he did pass on, there would be another on the job. Most contractors would agree that an excellent way to be rid of the evil competitor is to kill him, but there is the law. What, then, is the remedy?

Let the regular electrical contractor who is earnest in his unselfishness and big enough to swallow his false pride, first scan his own business conduct for any of the weaknesses and faults attributable to the other fellow. Let him first put his own house in order. The price-cutting competitor will soon take notice. He will begin to learn the right methods and to have confidence in the "regular fellow" who uses successful methods. That is 99% of the remedy. The next step is for the regular contractor to go and see the "outlawed" one, and keep going. The latter will soon be ready for any honest and legitimate idea that will eliminate the contracting ills of his city. If there is a contractor who has no heart in bending to win his competitor—who does not believe in helping the other fellow out of the rut—let him consider such treatment of the case from the standpoint of a cold-blooded business proposition, for it is true that if your competitor is not making money, he is not going to let you make it.

Once the electrical contractor gets selfishness out of his system he will quit cursing the central-station company and the jobber. That was the old method. Successful business men do not fight any more, and they do not try to force a competitor to do something—they show him the better way. The central-station companies and jobbers have their own troubles, and they know a thing or two about contractors. The contractor must have their confidence before he can succeed. It is well to remember that for everything the contractor has on them—and we have some things—they have one on the contractor. Let each electrical contractor question his conscience as to what he has done for a utility company or a jobber. It is to be feared that the slogan of some contractors has been to "do them."

How Organization Benefits Contractor and Nullifies Evil Competition.

Is the electrical contractor too selfish to take the time and spare the money to join and work with his chamber of commerce; does he give any of his time and energy to about half a dozen other movements in his town that would incidentally bring him recognition and respect due a progressive citizen in his community? Selfishness may be the cause of a contractor losing sight of many other such "good-business" opportunities in his community. If he is entirely out of these community activities, he is out of the minds of the people when they want electrical work done—he has lost some of the most profitable kind of advertising, that of personal popularity.

What chance has the electrical contractor to

selfishly "go it alone" in business today? From this time on he will find that, to be successful, he and his fellow contractors must depend upon each other—they call it co-operation—for business strength in the electrical industry. That is what organization is doing for us. The contractor who attends his local or state meetings is benefited by contact and exchange of ideas with his fellow contractors. His mind is broadened, his indifference and selfishness are dissipated, and he returns from his conventions with the assurance of moral support in the numbers of his association. In that condition of mind he will soon acquire sufficient determination and persistance to overcome the evils of "cut-throat competition" by winning the confidence and co-operation of his competitor.

The contractor owes a great deal—more than he can repay—to the officers and other active members of the National Association of Electrical Contractors and Dealers. They have given unselfishly of their time, and even of their own money, to the improvement of conditions for the electrical contracting business in general and for the "little fellows" of the contracting field in particular. It is not for the money there is in it that men like William L. Goodwin and Samuel C. Chase have carried to each contractor and dealer their messages of better methods in merchandising and contracting; it is because they are great, broad men with a vision and with a heart for those in need of their help. What such men are doing for all in the general field of contracting and selling appliances, we in our several communities can do for each other and thus benefit the entire electrical industry.

Everyone wishes to know what is going to happen to business during the next six months. Prominent men throughout the country vary in their outlook to a confusing degree. But here is a sure "tip" for the electrical contractor-dealer who, besides trying to obtain a profit, is trying to see how little he can buy and how much he can collect. It is the modern version of the old couplet, "Late to bed and early to rise; work like H and advertise."

POWER COMPANY TO BUY BALTIMORE GENERATING STATION.

The Consolidated Gas, Electric Light & Power Co., United Railways & Electric Co., and the Pennsylvania Water & Power Co., have entered into an agreement covering the sale of the electric generating station on Pratt street, Baltimore, owned by the two last noted companies, to the Consolidated company, and the purchase of power from the latter by the railway utility. The agreement provides for a payment of $4,000,000 for the power station, and for increased power supply by the Pennsylvania company to the Consolidated company, as required. The railway company in the future will devote its time exclusively to traction operation. Under a perpetual contract, with flexible terms adjusted to changing conditions, it will purchase all electric energy needed for the operation of its lines from the Consolidated company.

The power station has been operated solely as an emergency plant heretofore, with main source of supply rendered by the Pennsylvania company from its Susquehanna river plants. The United company has arranged for a note issue of $1,500,000, in connection with the agreement, and the Consolidated company will make a first payment of $1,250,000 on the plant as soon as the contract has been approved by the Public Service Commission, to which it has recently been presented. The negotiations for the change are said to have been in progress for nearly two years. C. D. Emmons is president of the United company, and Herbert A. Wagner is president of the Consolidated company.

EMPLOYE REPRESENTATION PLAN IS DISCUSSED.

Employes of the Commonwealth Edison Co., Chicago, held a meeting this week to elect delegates to meet representatives of the management for the purpose of considering the question of recommending a constitution for the plan of employe representation provided for in the creation of the industrial relations department, mention of which was made in the Jan. 15 issue of ELECTRICAL REVIEW. The constitution as recommended by this convention will then be submitted to all the employes and the representatives of the management to be voted upon. The constitution will become an established fact after receiving a majority vote of both the employes and representatives of the management. The adoption of the plan will provide a means whereby employes, through their own elected representatives, will be enabled to make recommendations and appeals on all matters affecting the particular interests of any employe, or group of employes, and the mutual interests of the management and the employes.

Under this plan there will be 78 employes and 78 management representatives, the latter being made up of the heads of departments and subdepartments. Their method of procedure follows the appointment of one delegate for about 100 employes in a given division. The plan further provides that every employe of the company will be represented by men whom he elects from among the employes of his division in the company organization. These representatives will speak and vote for him on all individual matters, or group matters, affecting his interests as an employe. The employe representative will be elected in semi-annual primaries and elections, by voting divisions, each made up of 100 employes, or major fraction of that number.

ELECTRICAL SECTION OF CANADIAN ASSOCIATION FORMED.

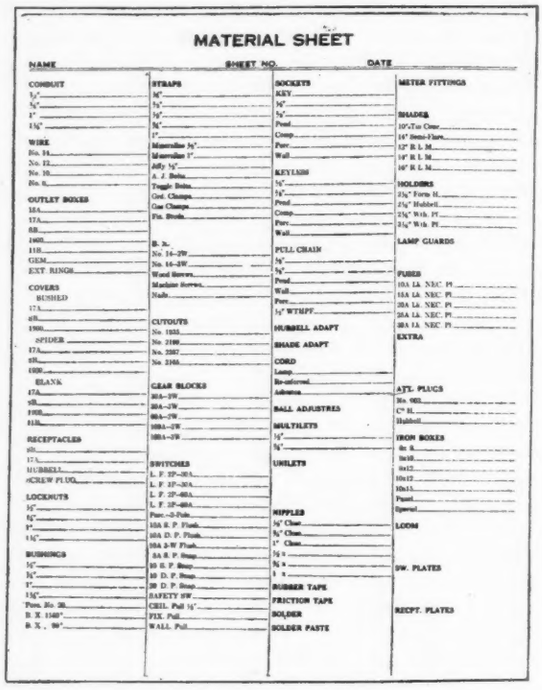
At Montreal recently there was organized an electrical manufacturers' section of the Montreal branch of the Canadian Manufacturers' Association, M. K. Pike, sales manager of the Northern Electric Co., being elected chairman of the section, and R. Moncel, Devoe Electric Switch Co., vice-chairman. According to present plans the section is to be composed of members of the Canadian Manufacturers' Association engaged in the manufacture of electrical apparatus and equipment and other manufacturers of similar equipment who may join the association in the near future.

Estimating the Cost in Electrical Contracting Business

Series of Forms Developed by Chicago Electrical Contracting Firm Makes Possible Accurate Estimates on Straight Contracts and Job Work in Addition to a Simplified Accounting System

By W. J. TEMPLEMAN
Supervising Electrician, Premier Electric Co., Chicago.

Electrical contractors, to be successful in this day and age, cannot afford to make rough guesses as to time and material for the jobs upon which they are called to furnish an estimate. If the contractor guesses too high he finds he is usually outbid by a more careful estimator. If he bids too low he finds he has to work for nothing, often going into his pocket or the till to make up his losses on labor and material. The only way to be right and fair to himself and the party for whom he does a job is for the contractor to know in advance exactly how much material will be required, the exact cost of that material and a very close approximation of the time and cost of labor required for the job—provided he is bidding in competition—or an exact accounting of the time if it is a time-and-material job.


MATERIAL SHEET

NAME SHEET NO. DATE

CONDUIT
½"
¾"
1"
1¼"

WIRE
No. 14.
No. 12.
No. 10.
No. 8.

OUTLET BOXES
1/4.
17A.
6B.
1400.
110.
GEM.
EXT. RINGS.

COVERS
BUSHED
17A.
6B.
1500.
SPIDER
17A.
6B.
1020.
BLANK
17A.
6B.
1500.
6B.

RECEPTACLES
6B.
17A.
HUBBELL
ARROW PLUG

LOCKNUTS
½"
¾"
1"
1¼"

BUSHINGS
½"
¾"
1"
1¼"
Fem. No. 20.
B. X. 1540".
B. X. , 39".

STRAPS
¾"
½"
¾"
1"
Materoller ½".
Materoller 1".
Jiffy ½".
A. J. Bolts.
Toggle Bolts.
Cut. Clamps.
Con Clamps.
Fix. Studs.

B. X.
No. 14-2W.
No. 16-2W.
Wood Screws.
Machine Screws.
Nails.

CUTOUTS
No. 1035.
No. 2180.
No. 2387.
No. 2160.

GEAR BLOCKS
30A—2W.
30A—3W.
60A—2W.
100A—2W.
100A—3W.

SWITCHES
L. F. 2P—30A.
L. F. 3P—30A.
L. F. 2P—60A.
L. F. 3P—60A.
Fuse—3-Pole.
15A S. P. Flush.
15A D. P. Flush.
15A 3-W Flush.
5A S. P. Snap.
10 S. P. Snap.
10 D. P. Snap.
20 D. P. Snap.
SAFETY SW.
CEIL. Pull ½".
FIX. Pull.
WALL Pull.

SOCKETS
KEY.
½"
¾"
Pend.
Comp.
Porc.
Wall.

KEYLESS
½"
¾"
Pend.
Comp.
Porc.
Wall.

PULL CHAIN
½"
¾"
Pend.
Wall.
Porc.
½" WTHPF.

HUBBELL ADAPT
SHADE ADAPT
CORD
Lamp.
Re-inforced.
Asbestos.

BALL ADJUSTRES
MULTILETS
½"
¾"
UNILETS

NIPPLES
½" Close
¾" Close
1" Close
½ x
¾ x
1 x

RUBBER TAPE
FRICTION TAPE
SOLDER
SOLDER PASTE

METER FITTINGS

SHADES
10"-Tin Cone.
14" Semi-Flare.
12" R. L. M.
14" R. L. M.
16" R. L. M.

HOLDERS
2¼" Form H.
2¼" Hubbell.
2¼" With Pl.
2¼" With Pl.

LAMP GUARDS

FUSES
10A 1A. NEC. Pl.
15A 1A. NEC. Pl.
20A 1A. NEC. Pl.
25A 1A. NEC. Pl.
30A 1A. NEC. Pl.
EXTRA

ATT. PLUGS
No. 003.
C" H.
Hubbell.

IRON BOXES
6x 6.
8x10.
10x12.
10x15.
Panel.
Special.

LOOMS

SW. PLATES

RECPT. PLATES

Form No. 1.

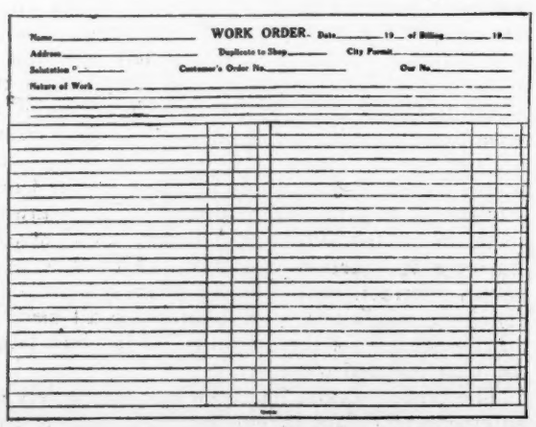
One firm of electrical contractors in Chicago has perfected, as the result of three years' daily development, a cost and estimating system which the members feel is very satisfactory for the present, but which they expect to further develop as experience and necessity points the way. This system consists of a series of six forms, the first of which is the "Material Sheet," the second the "Work Order," the third the "Time Card," the fourth the "Time Slip" for time-and-material jobs, the fifth the "Shop Order," and the sixth the "Job Ticket."

When the firm receives a call for its services a supervisor or estimator calls upon the customer for the purpose of obtaining an outline of the work required, taking the necessary data and measurements. If the customer desires an estimate, Form No. 1 is used for entering the material and costs in preparation for the estimate. However, as 90% of the work is obtained on a time-and-material basis, Form No. 1 is used very little for this purpose.

Method of Organizing Before Starting Job.

If it is a time-and-material contract the items and quantity of material are entered on Form No. 1 for the guidance of the stockkeeper in packing and sending the material to the job. A duplicate of this sheet is also given the wireman so he can see at a glance just what material he has on hand with which to start the work. The men are also given additional blank copies for their use so that, as the work proceeds and they find that more material is needed, they can make a record of it and at the same time, when they call for the material, they will use the same trade names and numbers as are used by the office.

Form No. 2, the "Work Order" sheet, is also made out for the job and the original material sheet is attached thereto. On Form No. 2 the necessary data is entered pertaining to the job. This form, in addition to the date of the contract and of billing, contains the name and address of the customer, the "salutation," nature of work,


Name WORK ORDER. Date 19 of Billing 19
Address Duplicate to Shop City Permit
Salutation Customer's Order No. Our No.
Nature of Work

Form No. 2.

city permit, customer's order number and the firm's number. A duplicate is sent to the shop.

The firm has a complete set of standard salutations on a master sheet, with each salutation numbered. These salutations outline the class of work to be done, as, for instance: No. 1 is the salutation for "Complete installation of electrical work as directed"; No. 2 is for "Services of electrician on reported trouble call," etc. In making up Form No. 2 there is inserted after the heading "Salutation," the proper salutation number; then, when invoicing, the corresponding salutation is written out in full at the head of the invoice rendered to the customer. Under the heading, "Nature of Work," there is given a concise outline of the work executed.

Suggestions Obtained From Workmen Reduce Installations Cost.

When the work is ready to be started, the person who has had the contract in hand from the

TIME CARD

Date_____192

Name_____

	S	M	T	W	T	F	S
8 00							
15							
30							
45							
9 00							
15							
30							
45							
10 00							
15							
30							
45							
11 00							
15							
30							
45							
12 00							
15							
30							
45							
1 00							
15							
30							
45							
2 00							
15							
30							
45							
3 00							
15							
30							
45							
4 00							
15							
30							
	Overtime						
4 30							
45							
5 00							
15							
30							
45							
6 00							
15							
30							
45							
7 00							
15							
30							
45							

Form No. 3.

beginning goes out to the job with the workmen. He outlines the work as he has laid it out and, while doing so, he encourages the views and observations of the workmen to see if they can offer any suggestion that will lend itself to a more economical execution of the installation. As most of the work of this firm is what they term "jobbing work," and as nearly every job develops some new feature, the time spent in getting suggestions more than pays the labor cost.

Every workman is supplied with copies of Form No. 3, upon which he must enter his daily

PREMIER ELECTRIC COMPANY....
3123 S. Wabash Avenue
Electrical Repairing, Construction Supplies
Phones: Harrison 5020 Wabash 4004

TIME SLIP

Chicago_____191

To_____

Time Out

Time In

To Our Customers

Our man left shop as recorded at left. Time is charged until he returns and RECORDS TIME IN

No invoice rendered for less than one hours time.

_____, Wireman

_____ Helper

Registered Electricians
It is unlawful for us to do construction work without a permit issued by the Department of Electricity of the City of Chicago

Form No. 4.

time, together with the name of the job, to be turned into the office. If he is on the job for the entire week he uses one sheet; if he is on a number of jobs, he uses one sheet for each day. From Form No. 3 the workman's time is entered on Form No. 2 and his time totaled, checked and entered into the payroll time book. These sheets are then filed away and kept for about six months in the event there is a necessity of checking them back, or that they may be wanted by the auditors of various insurance companies.

Workmen are also supplied with copies of Form No. 4. These are used for time-and-material jobs and for extra work on contract jobs. There must be a sheet for each job for each day, and it must be signed by the customer or his authorized representative. These sheets are turned into the office with Form No. 3 and afterward attached to Form No. 2 for that job.

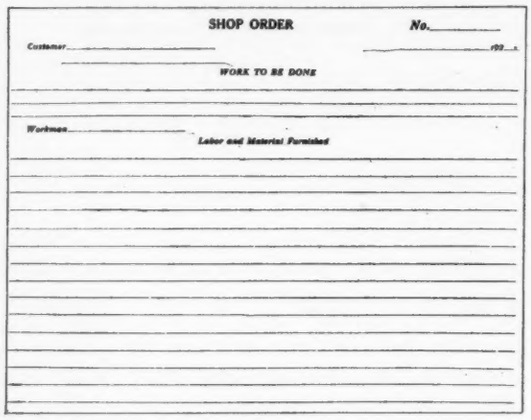
Accounting Is Simplified by Use of Forms.

Upon completion of the job the material not used is returned to the shop where it is credited on Form No. 1, the credit being indicated by the figures denoting the net quantity, and inclosed in a circle immediately after the figures denoting the quantity of each particular item sent out to the job. The complete work-order sheet (Form No. 2) and attached sheets are then turned over to the clerk, who enters the total amount used on the line of each item, and at the extreme right of the column in Form No. 1. These totals are then entered on the copy of Form No. 2 for that job, the entries consisting of the quantities, with a designating number for each item. This designating number is obtained from a master sheet which is a copy of Form No. 1, with each item numbered and written out so that the average layman can understand what each item represents. As an example: No. 1 is "½-in. black loricated conduit," and No. 5 is "No. 14 single-braid, solid rubber-covered wire."

In case of a contract job the clerk "costs" the job on Form No. 2 by entering the firm's cost alongside the number designating the material, entering the amount in dollars and cents in the column at the right. After the entire job is "costed" by writing in the prices to be billed to the customer, the papers are turned over to the biller who makes out the invoice. If it is a contract job the biller writes the proper "salutation"

and "nature of work" at the head and extends the total contract price to the proper column.

In the case of a time-and-material job the master sheet is consulted and, instead of using the number for the materials, the proper words are used for each item, these being written on the


SHOP ORDER No.

Customer

WORK TO BE DONE

Workman

Labor and Material Furnished

Form No. 5.

invoice with the unit prices for each and the totals extended. From there it goes to the bookkeeper and through regular channels until the sheets are filed away according to the job number.

Keeping Account of Repairs and Other Shop Work.

The shop work, which consists of repairing, rebuilding and rewinding motors and other electrical machinery, is operated on about the same principle of accounting. When a motor is received an original and a duplicate of Form No. 5 are made out, together with a tag to be attached to the motor. This tag bears the name of the customer and the shop order number. The original of Form No. 5, (shop order,) which is of a different color than Form No. 2, (work order,) in order to distinguish shop from construction work, is kept in the office. The duplicate, together with a copy of Form No. 6, is sent to the shop foreman. The foreman sees that the apparatus is tagged and that the proper data is set down on the sheet as the work is executed.

Workmen's time for the various jobs is controlled by a time clock, and at the end of the day the time cards are turned into the office and the time entered from them onto the respective "shop-order" sheets. After the work is completed and shipped out, the duplicate of the "shop-order" data sheet and shipping receipt are turned into the office and attached to the original sheet.

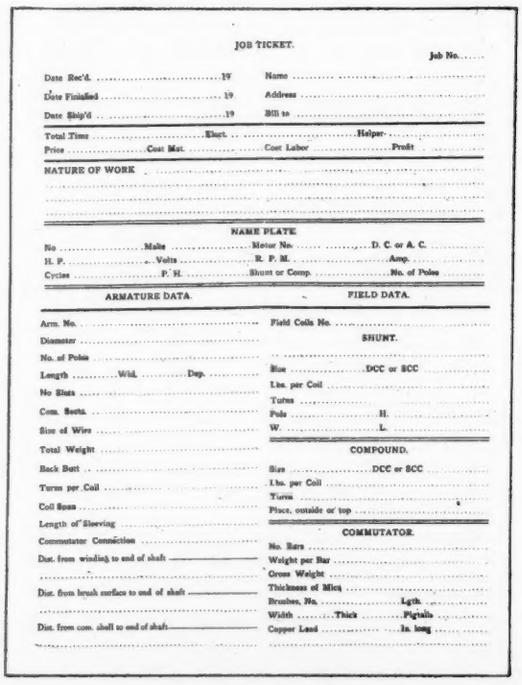
CIVIL SERVICE EXAMINATION FOR INSTRUMENT MAKER.

An open competitive examination for electrical instrument maker has been announced by the United States Civil Service Commission, applications to close Feb. 8. Applicants must show that they have completed a common-school or equivalent education and have served an apprenticeship of at least four years, or an equivalent thereto, as instrument maker or in a model shop, at least six months of which time was devoted to the construction of electrical apparatus. Those desiring to make application should write to the commission, Washington, D. C., asking for form 1800 and mentioning the title of the examination desired.

DOMESTIC PRODUCTION OF COPPER DURING 1920.

The smelter production of copper from domestic ores during the year 1920 is estimated by H. A. C. Jensen, of the United States Geological Survey Department of the Interior, to be about 1,235,000,000 lbs., compared with 1,286,000,000 lbs. for 1919. The production of refined copper from foreign and domestic ores for the year was about 1,573,000,000 lbs., which is approximately 195,000,000 lbs. less than for the year 1919. The apparent domestic consumption was about 910,000,000 lbs.; in 1919 it was 877,000,000 lbs. The stocks of raw and refined copper at the end of 1920 were about 874,000,000 lbs., which represents a decrease of 30,000,000 lbs. from those held at the end of 1919. The total imports of raw and refined copper for the ten months ending October 30, 1920, according to the Bureau of Foreign and Domestic Commerce, were 407,437,515 lbs. Exports of copper for the same period were 543,695,851 lbs., compared with 516,627,775 lbs. for the entire year 1919.

The continued decreased production, the large stocks, and the low domestic consumption were due entirely to the generally depressed conditions of industry throughout the world, which did not permit the absorption of as great quantities of


JOB TICKET.

Job No.

Date Rec'd. 19 Name

Date Finished 19 Address

Date Ship'd 19 Bill to

Total Time Elect. Helper

Price Cost Mat. Cost Labor Profit

NATURE OF WORK

NAME PLATE.

No Make Motor No. D. C. or A. C.

H. P. Volts R. P. M. Amp.

Cycles P. H. Shunt or Comp. No. of Poles

ARMATURE DATA.

Arm. No.

Diameter

No. of Poles

Length Wid. Dep.

No Slots

Com. Segts.

Size of Wire

Total Weight

Back Batt

Turns per Coil

Coil Span

Length of Sleeving

Commutator Connection

Dist. from winding to end of shaft

Dist. from brush surface to end of shaft

Dist. from com. shell to end of shaft

FIELD DATA.

Field Coils No.

SHUNT.

Size DCC or SCC

Lbs. per Coil

Turns

Pole H.

W. L.

COMPOUND.

Size DCC or SCC

Lbs. per Coil

Turns

Place, outside or top

COMMUTATOR.

No. Bars

Weight per Bar

Gross Weight

Thickness of Mica

Brushes, No. Lgth.

Width Thick Pigtails

Copper Lead In. long

Form No. 6.

copper as had been hoped for. Low exchange and the great stocks of scrap and secondary copper available both in the United States and abroad also decreased the demand for new copper. The salient features of the copper industry during 1920 were a small hesitating demand, decreased production, continued small exports, particularly during the last half of the year, and labor troubles.

Alternating-Current Motors and Control Equipment

Ninth of a Series of Articles on Principles and Application of Motor-Control Apparatus — Discussion of Types of Alternating-Current Motors With Special Reference to Their Control

By G. J. KIRKGASSER and E. W. SEEGER

Types of Alternating-Current Motors.—There are three principal types of alternating-current motors in general use: induction, synchronous and commutator-type motors. Induction motors are built in all sizes and are the most common type. Synchronous motors cost more in the smaller sizes than other types and because of their inherent characteristics are seldom used in ratings below 100 hp. Commutator-type motors are usually designed to operate on single-phase circuits and are built only in the smaller sizes.

Single-Phase Induction Motors.—Induction motors are designed for operation on both single and polyphase systems. Single-phase motors are used principally in the fractional horsepower sizes. They do not have any starting torque, and for this reason special provisions must be made for bringing them up to speed.

Some of these motors can be started simply by vigorously turning the machines over by hand, but the usual method is to start them in the same manner that polyphase machines are started. A special "starting" winding is provided for this purpose, the two windings being connected in parallel across the single-phase source of supply. Resistance is placed in series with one winding, and reactance in the other, so that there is a phase difference between the currents in the two windings during the starting period. The motor will then act as a polyphase machine. After the motor has reached full speed the "starting" winding is disconnected and the "running" winding connected directly to the single-phase supply circuit.

Polyphase Induction Motors.—There are three types of polyphase induction motors: standard squirrel-cage, high-torque squirrel-cage, and slip-ring. The stator or stationary windings may be the same for all types, but the rotor windings differ. The squirrel-cage rotor consists of a number of conductors spaced evenly around the armature and fastened together at the ends with short-circuiting bars. The high-torque rotor is usually made up with a winding of insulated wire, and the ends of the windings either connected together or to internal resistance. The rotor of the slip-ring motor is similar to the high-torque rotor, except that in this case the ends of the windings are brought out to slip rings, and external resistance connected to these rings for starting duty or for speed regulation.

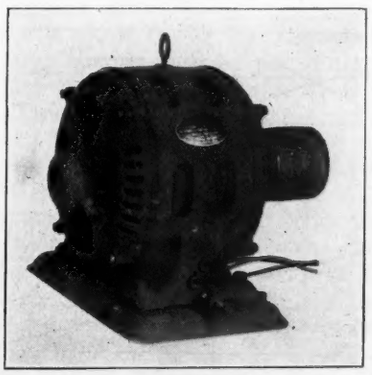


Fig. 55.

Squirrel-cage induction motor manufactured by the Mechanical Appliance Co.

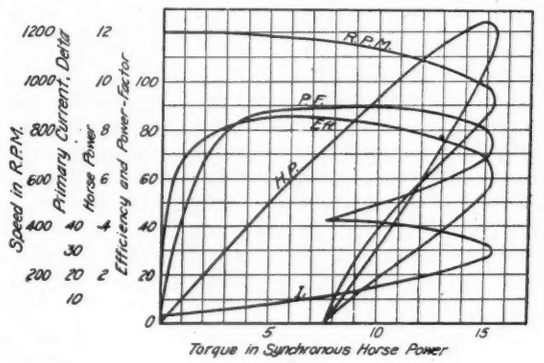


Fig. 56.

Characteristic curves of a 5-hp. standard squirrel-cage induction motor.

Squirrel-Cage Induction Motors. — The squirrel-cage motor can be started by connecting it directly to the supply circuit without resistance in series. When started in this way, however, the value of the initial current is from five to eight times the normal full-load current, while the starting torque is about one and one-half times normal. For small motors this high starting current is not very objectionable, but for motors of 5 hp. rating and larger the value of the starting current is so high that power companies usually insist on the use of starting controllers in connection with such motors.

If the voltage impressed on the motor circuit is reduced to 50% of normal the current will also be reduced proportionately. The torque, however, varies approximately as the square of the voltage, and will be reduced to one-fourth of normal starting torque, or approximately 35%. It is at once apparent that if the starting torque is only 35% of normal the motor will not be able to start under full load; in case this is necessary,

a slip-ring or wound-rotor motor should be used.

The speed of a squirrel-cage motor can be regulated by varying the amount of external resistance in series with the primary windings. This method is not only inefficient, but the voltage drop

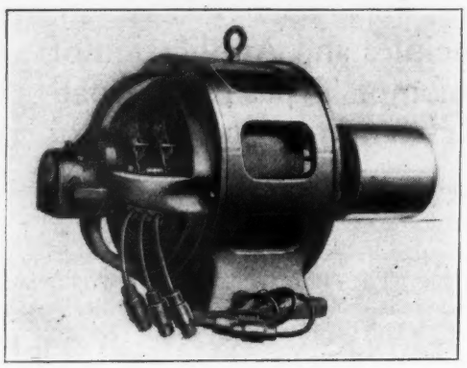


Fig. 57.

Lincoln slip-ring polyphase induction motor of 15-hp. capacity.

across the resistance causes a reduction in the motor voltage and torque. If too much external resistance is used the "pull out" torque of the motor will be exceeded and the motor will stop. The value of the current when the motor is "stalled" is, of course, very high, and results in blown fuses, burned-out resistors or motor windings. This method of obtaining speed variation is seldom used.

Fig. 56 shows the characteristic curves of a 5-hp. squirrel-cage motor, from which it will be noted that although the power-factor is about 87% at full load, it practically drops to zero at no load. At the same time the current at no load is about 40% of normal full-load current. For these reasons squirrel-cage motors are inefficient and objectionable when running light or at partial load.

Slip-Ring Induction Motors.—The characteristics of this type of motor, when the slip rings are short-circuited, are practically the same as those of the squirrel-cage motor. If resistance is inserted in the rotor or secondary circuit the starting current is reduced. As the resistance is increased the starting torque also increases until the maximum torque of the motor is reached. A further increase in resistance causes the starting torque to decrease. This is shown quite clearly in Fig. 58. The curve *A* shows the characteristics of the motor with slip-rings short-circuited, and it will be noted that the starting torque is only about 140% of normal, while the primary starting current is about six times normal. Curve *B* shows the operating curve of the motor with some resistance in the secondary current; in this case the starting torque has been increased and the starting current reduced. Curve *C* shows the condition when just enough resistance has been inserted in the secondary circuit to give maximum torque. Curve *D* shows that by adding still more resistance the torque is reduced. Curve *D* further indicates that full-load starting torque is obtained with full-load current.

If the voltage of the supply circuit remains constant, the primary current depends upon the torque and is independent of the amount of resistance in the secondary circuit. With a load requiring 200% torque, the primary current of the motor as indicated in Fig. 58 will be 40 amperes, regardless of whether the motor is running at 800 r.p.m., as shown by curve *C*; 1200 r.p.m., as shown by curve *B*, or 1550 r.p.m., as shown by curve *A*.

It is therefore possible to start a slip-ring motor in practically the same way that a direct-current motor is started. Resistance is inserted in two or three phases of the secondary circuit to reduce the initial current, and this resistance is gradually shunted out to bring the motor up to full speed.

Speed regulation of alternating-current motors is usually obtained by varying the amount of external resistance in the secondary circuit. However, this method is open to the same objections as those applying to the control of direct-current motors by varying external resistance in the armature circuit. The speed varies with the load, and the efficiency is low due to the loss of power in the resistance.

High-Torque Squirrel-Cage Motors.—High-torque motors have starting characteristics similar to those shown by curve *C*, Fig. 58. The resistance in the rotor circuit is designed to give maximum torque or a little less. In some cases where the motor is used for intermittent service the motor is allowed to operate with this resistance in circuit. In other cases a lever or handle is provided by means of which the operator can short-circuit the resistance. In some motors a centrifugal device shunts out the resistance when the motor is almost up to full speed.

Multispeed Induction Motors. — Usually when speed reduction is required in connection with an induction motor the slip-ring type is used. This is not satisfactory, however, where it is desired to maintain constant speed with a varying load. There is also some objection to the additional complication of the slip rings and and the regulating resistor.

Several manufacturers are now building multi-speed squirrel-cage motors with which speed changes are obtained by varying the number of poles of the stator winding. The usual practice is to provide a separate winding for each speed, which necessitates additional winding space, and these motors are accordingly larger and more expensive than the standard types. Some manu-

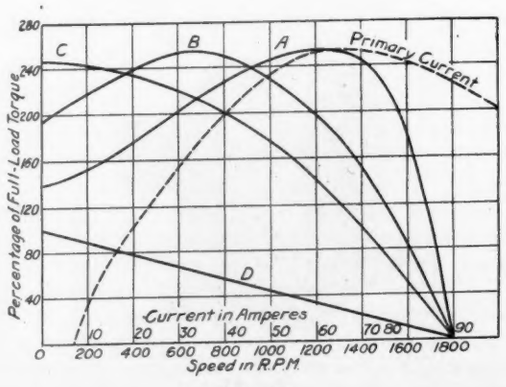


Fig. 58.

Characteristic curves of a slip-ring induction motor.

facturers do not provide a separate winding for each speed, but change the number of poles by regrouping the stator coils. With this construction four speeds are usually obtained with two windings. The controller, however, is more complicated and the combined cost of motor and controller is practically the same for either type of construction.

Some idea of the cost of the multispeed motor may be obtained from the fact that a 5-hp. four-speed motor with speeds of 600, 900, 1200 and 1800 r.p.m. requires the same frame as a standard 20-hp., 1200-r.p.m. motor. Slip-ring motors with multispeed (usually two) stator windings are also available.

These motors are particularly valuable for elevator or similar service where a slow speed for accurate stopping is essential. When a standard slip-ring motor is used the starting resistance is inserted to obtain the slow speed, but if the load is overhauling and resistance is inserted the motor speed will increase instead of decrease. Before the introduction of the two-speed motor it was practically impossible to obtain satisfactory results with an elevator motor if the car speed

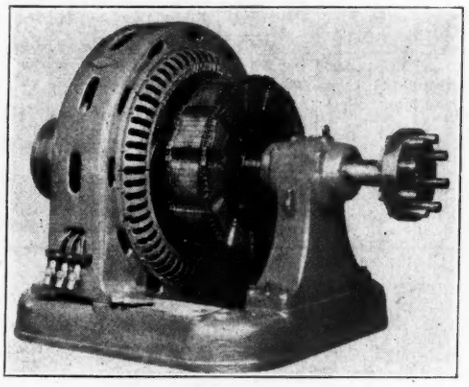


Fig. 59.

Synchronous motor with rotor moved out to show the construction of the field poles and starting windings.

exceeded 150 ft. per minute. With two-speed motors, however, satisfactory installations have been made with car speeds of approximately 450 ft. per minute.

There have been comparatively few installations of multispeed induction motors, but the extreme simplicity of the squirrel-cage motor compared to other types is sure to lead to an increased use of this type.

Synchronous Motors.—A typical synchronous motor is shown in Fig. 59. The synchronous motor differs from the other types of alternating-current motors in that its rotor is made up of a number of field poles which have direct-current excitation. The speed is constant for all loads and depends on the number of poles of the motor and the frequency of the supply circuit. Synchronous motors will not start under load and are sometimes brought up to speed by auxiliary motors. They are usually, however, supplied with squirrel-cage windings in the pole faces and started as induction motors, usually by means of auto-transformers.

A great deal of experimental work has been done in an attempt to build synchronous motors which will start under load. The most successful results have been obtained by the use of a double induction winding or starting. One winding is placed near the outer edge of the rotor and the other a little behind the first. The outer winding is effective at slow speeds and is proportioned to give a high torque during the starting period and very little torque as the motor approaches synchronous speed. The inner winding does not have any effect at starting because at high frequencies the flux does not penetrate to this winding. As the motor accelerates, however, the frequency decreases and the inner winding becomes effective. It is usually a very low resistance winding, so that the slip is small, and it is accordingly possible to approach very close to synchronous speed with this arrangement.

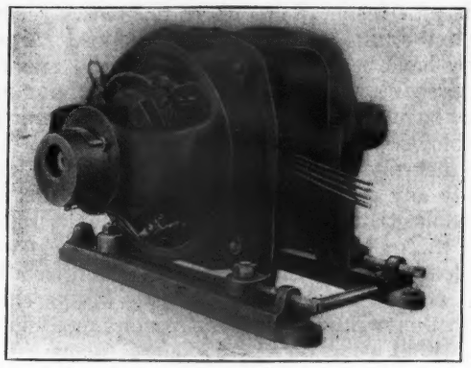


Fig. 60.

Kimble single-phase variable-speed motor of 2.5-hp. capacity.

Special provision must be made for handling the field circuit during starting. The field is, of course, wound with a large number of turns, and the revolving stator field induces an extremely high voltage in this winding. The most common method of protecting against insulation breakdown is to short-circuit the field through a resistance during starting. Another means of obtaining this protection is to provide a field break-up switch to limit the voltage induced in any one section of the field. Some manufacturers connect the field directly to the exciter armature during starting, but when this method is used a heavy damping winding is usually placed around the field poles. If the field is not connected to the exciter during the starting period it is connected to the direct-current supply just before or just after the "running" switch is closed.

Synchronous motors have been used on a wide

Fig. 61.

Wagner 5-hp. single-phase repulsion-type induction motor.

variety of installations where the power requirements are fairly large and the speed low. A great many have been used on large air and ammonia compressors which can be started without load. They have also been used on motor-generator sets for blowers and pumps.

Synchronous motors can be adapted to practically any constant-speed drive if they are used in connection with a magnetic clutch. In this case the motor is first brought up to speed without load, after which the clutch is energized. The load is then accelerated by means of the clutch. With this arrangement synchronous motors have even been used on crushers, the torque of the magnetic clutch being adjusted so that it is below the "pull out" torque of the motor, and when heavy loads come on the equipment the clutch simply slips.

The great advantage of synchronous motors lies in the fact that the power-factor may be varied by changing the field excitation. In a plant where a large number of small induction motors are used the power-factor is usually low, and a synchronous motor is often installed to operate at leading power-factor and so improve the power-factor of the system.

Commutator-Type Motors.—There are three principal types of single-phase commutator motors: series, repulsion and repulsion induction motors.

The series motor has practically the same characteristics as the direct-current series motor and is built along the same general lines. The field poles are laminated and a winding to compensate for armature inductance is usually included. The smaller sizes can be connected directly to the line for starting, but for the larger sizes the voltages across the motor should be reduced either by a series resistance or by an auto-transformer. The speed of the motor can be varied by either of these methods. The direction of rotation may be changed by reversing either the armature or field connections.

There are several types of repulsion motors being manufactured. They are all provided with field windings and armature windings, and the

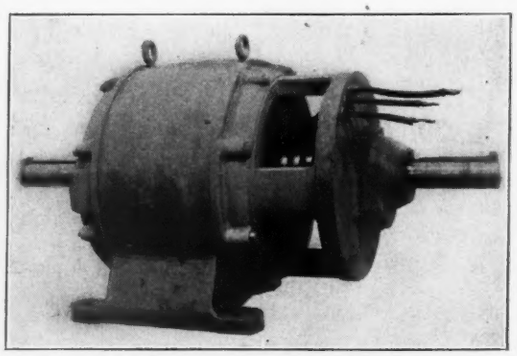


Fig. 62.
Inclosed Three-phase Crane Motor Manufactured by the Northwestern Electric Co.

main brushes are short-circuited. Various combinations are used for obtaining armature compensation. These motors can in general be reversed by shifting the brushes, although the General Electric Co. "Type RI" motor is provided with a reversing field winding. Motors of this type are usually connected directly to the line for starting.

The repulsion induction motor starts as a repulsion motor and for this reason has a high

AMPERE RATINGS OF A. C. MOTORS

H.P.	Single Phase				Two Phase					Three Phase				
	Volts				Volts					Volts				
	110	220	240	550	110	220	440	550	2200	110	220	440	550	2200
¼	4.	2.	1.	.8	....	....	....	....	....	....	....	....	....	....
½	7.5	3.75	1.9	1.5	3.8	1.9	.95	.8	....	4.4	2.2	1.1	.9	....
¾	10.	5.	2.5	2.	....	....	....	....	....	....	....	....	....	....
1	12.5	6.25	3.2	2.5	7.	3.5	1.75	1.4	....	8.	4.	2.	1.6	....
1½	.18	9.	4.5	3.6	9.	4.5	2.25	1.8	....	10.3	5.1	2.6	2.1	....
2	24.	12.	6.	4.8	11.	5.5	2.75	2.2	....	12.5	6.25	3.2	2.5	....
3	34.	17.	8.5	6.8	15.8	7.9	4.	3.2	....	18.	9.	4.5	3.6	....
4	43.	22.	11.	8.6	21.	10.5	5.3	4.25	....	24.	12.	6.	4.8	....
5	55.	28.	14.	11.	26.2	13.1	6.6	5.25	....	30.	15.	7.5	6.	....
7½	80.	40.	20.	16.	38.6	19.3	9.7	7.75	....	44.	22.	11.	8.8	....
10	105	53.	25.	21.	50.8	25.4	12.7	10.2	....	58.	29.	14.5	12.	....
15	145	73.	36.	29.	72.	36.	18.	14.5	4.0	82.	41.	20.5	16.5	4.5
20	200	100	50.	40.	96.	48.	24.	19.2	5.25	110	55.	27.5	22.	6.
25	250	125	63.	50.	120	60.	30.	24.	6.6	136	68.	34.	27.2	7.5
30	295	148	74.	59.	140	70.	35.	28.	7.4	160	80.	40.	32.	8.5
40	370	185	93.	74.	184	92.	46.	37.	9.6	212	106	53.	42.5	11.
50	....	....	....	....	230	115	57.5	46.	11.8	264	132	66.	53.	13.5
60	....	....	....	....	276	138	69.	55.	14.	316	158	79.	63.	16.
75	....	....	....	....	344	172	86.	69.	17.5	392	196	98.	78.5	20.
100	....	....	....	....	454	227	114	91.	22.8	518	259	130	104	26.
125	....	....	....	....	556	278	139	111	2.8	636	318	159	127	32.
150	....	....	....	....	666	333	167	133	33.	760	380	190	152	38.
175	....	....	....	....	779	390	195	156	39.	890	445	223	178	45.
200	....	....	....	....	892	446	223	178	45.	1020	510	255	204	51.
250	....	....	....	....	1086	543	272	217	55.	1250	625	313	250	62.5
300	....	....	....	....	1314	657	329	263	66.	1500	750	375	300	75.
400	....	....	....	....	1750	875	438	350	87.5	2000	1000	500	400	100
500	....	....	....	....	2180	1090	545	436	109	2500	1250	625	500	125

Fig. 63.

starting torque. When the motor is almost up to full speed a centrifugal device lifts the brushes and short-circuits the commutator; the motor then operates as an induction motor. Fig. 61 shows a motor of the repulsion induction type.

(To Be Continued.)

ELECTRICAL SUPPLY JOBBERS ASSOCIATION TO MEET.

The quarterly meeting of the Atlantic Division, Electrical Supply Jobbers Association, will be held at the Commodore Hotel, New York City, March 15. The Central Division will meet in Chicago on the same day. The executive committee of the association will convene in Cleveland March 16-17, and at Hot Springs, Va., May 23-24, the general meeting of the organization having been arranged for May 25-27 at the latter place.

RADIO CORP. INAUGURATES SERVICE TO FRANCE.

The Radio Corp. of America inaugurated wireless telegraph service to France on a commercial basis Jan. 18, after a preliminary period of testing work. The receiving station on this side is at Belmar, N. J., and on the French territory, at Ville Juif, near Paris, with transmitter at Lyons. The transmission is being made through the large station at Tuckerton, N. J., where a 200-kw. alternator of high-frequency type is in service.

Some Electrical Causes of Dust Explosions

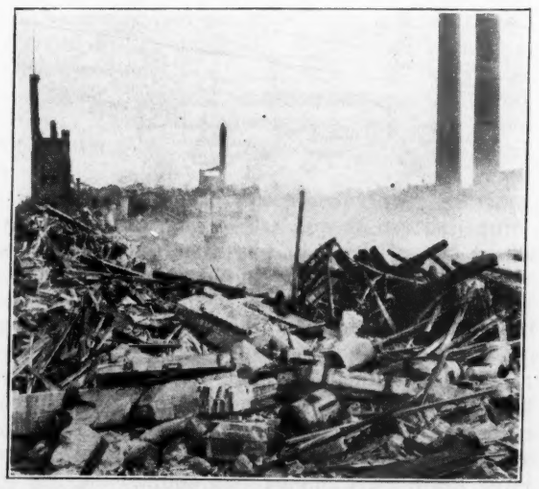
Results of Investigations of Explosions and Fires Attributed to Electricity—Precautionary Measures Being Taken—Static Electricity a Menace to Grain-Threshing and Cotton-Mill Operations

By DAVID J. PRICE

Engineer, Bureau of Chemistry, U. S. Department of Agriculture.

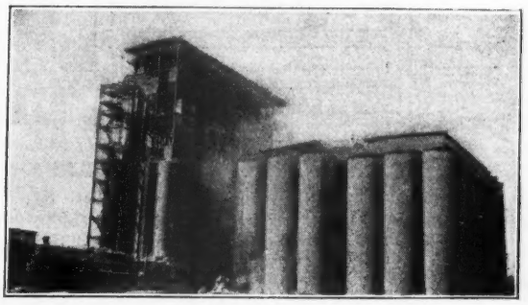
Dust explosions can occur in any industrial plant where flammable dusts are created during the operating process. Explosions resulting in large losses of life, foodstuffs and property have taken place in grain elevators, flour mills, cereal and feed mills, starch factories, sugar refineries, cocoa and chocolate plants, and similar industries. Disastrous explosions of "aluminum dust" and "hard rubber dust" in large factories in the Middle West have recently attracted considerable attention. Reports of explosions in wood-working establishments, paper mills, woolen mills and spice mills have also been received. Since May, 1919, at least seven such disastrous dust explosions occurred in the United States and Canada, resulting in the loss of 88 lives and property damage in excess of $7,000,000.

Recently attention has been attracted to the large number of dust explosions and resulting fires associated with the use of electrical appliances and equipment. Some of these explosions have occurred in industrial plants where the electrical equipment had been installed in accordance with standard requirements, and where methods, in many respects considered safe, were being followed. Many of the explosions have occurred in modern, improved, up-to-date plants in which every advantage had been taken of the science of milling engineering and where precautionary methods were generally adopted. The investigation of these explosions has developed new causes, some of which are of an electrical nature. This article considers this particular phase of the problem, with special reference to more recent determinations.



Factory in the Middle West Completely Destroyed by Starch-Dust Explosion.

It is generally understood that dust explosions have been caused by use of matches, open flames or lanterns in dusty atmospheres. These may be considered as the simple or common causes as distinguished from the mechanical or operating causes. It now develops that electrical sparks will ignite dust, that the use of electric bulbs in dust clouds may result in an explosion if the bulb is broken and that static electric charges may easily cause such explosions.



Large Terminal Grain Elevator Badly Wrecked by Dust Explosion Assigned to Electrical Cause.

Similarity Between Dust and Gas Explosions.

In the experimental work which has been conducted by the United States Bureau of Chemistry it has been found that a dust explosion behaves very much like a gas explosion. It requires a certain mixture of dust and air, together with an external source of ignition. Just as gas and air must be intimately mixed in proper proportions in the cylinder of an internal combustion engine so these dusts must be in suspension in the air as a cloud, intimately mixed with air and in certain proportions. Neither the mixture of gas and air nor that of dust and air will explode until it comes in contact with a flame or some other source of heat sufficient to cause it to ignite.

The explosive limits of methane gas range from 5.5 to 14.5%, with the highest explosive mixture at about 9.6%. The various explosive dusts apparently have similar explosion limits. It has been determined that an explosion will propagate in an atmosphere containing from 0.023 to 0.032 oz. of coal dust per cubic foot of air.[1] Since experimental work has shown that the grain

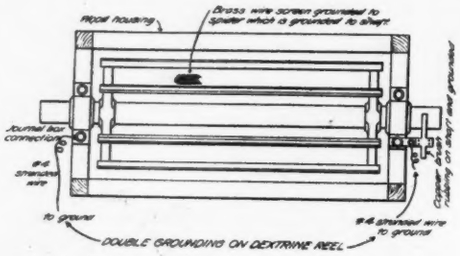
[1] U. S. Bureau of Mines Circular, No. 3, "Coal Dust Explosions." U. S. Bureau of Mines Bulletin 20, "The Explosibility of Coal Dusts."

dusts are even more flammable than coal dust, it may be inferred that a less quantity of grain dust is required per cubic foot than of coal dust.

It also appears that grain dusts can be ignited more readily and propagate flame more rapidly than coal dust. Much work has been done to determine the relative ignition temperatures of the dusts, and it has been found that dextrin and starch can be ignited with a temperature as low as 540 deg. C. and will propagate flame at from 800 to 900 deg. C.[2]

Early Investigations and Experimental Work in Minneapolis.

The first noteworthy dust explosion on record in the United States occurred at the Washburn-Crosby flour mill at Minneapolis on May 2, 1878. Valuable experimental work was conducted by


Mill housing
Brass wire screen grounded to spatter which is grounded to shaft
Journal box connection
#6 Stranded wire
To ground
#6 Stranded wire to ground
DOUBLE GROUNDING ON DEXTRINE REEL

Double Grounding Method for Dextrine Reel, Showing Journal-Box Connection and Copper Brush Contact.

Professors Peck and Peckham of the University of Minnesota at that time. From the conclusions of their experiments it will be noted that although the dusts tested were readily ignited by the larger source of heat and flames, the investigators state that under the conditions of testing it was not possible to ignite the dust by electric sparks. This fact is of special interest in view of recent developments. The following instances show the general nature of the more recent conclusions.

Sparks From Electrical Equipment Found to Ignite Dust.

Dust explosions have resulted from the ignition of the dust by electric sparks from motors, switches, blown fuses or defective electric equipment. In one instance an explosion was caused by an electric spark from a blown fuse in a plant manufacturing oil cake, resulting in the loss of 39 lives and injuries to 101 others. The investigators concluded that "the explosion was caused by the bursting of an uncovered fuse on a temporary switchboard at the very moment when a dust cloud was formed by the breaking of a large disintegrator belt." This belt was 6 ins. wide and ran at a speed of 5000 ft. per min. From the statement of the workmen it appeared that when the belt broke it caused a cloud of dust like a fog for a minute or two, due to the dislodging of accumulations of dust on girders, machinery and plant equipment.

Electric Lamp Globes Broken in Dust Clouds.

Explosions have also taken place when incandescent lamps have been broken in dust clouds. A recent explosion of starch dust was caused by the workmen lowering an extension lamp into a dusty starch bin. The dust was ignited by the breaking of the globe in the dusty atmosphere, and the explosion propagated throughout the nearby sections of the mill.

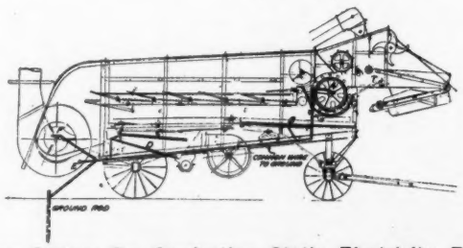
Explosions of this nature have also followed the introduction of extension lamps into various types of milling equipment where dust clouds are present. In one case the lamp was accidentally dropped into a grinding machine, followed immediately by a flash of flame. In another instance the introduction of the extension into an elevator leg, where the lamp was broken, resulted in a violent explosion. Very recently another very similar explosion occurred in one of the largest grain elevators in Buffalo, when the workmen permitted an extension lamp to be carried with the grain stream into the elevator pit.

The possibility of dust ignition by such breaking of electric lamps in parts of industrial plants where dust may be in suspension has been conclusively shown by these recent expolsions. This development is of vital importance to industrial plants and emphasizes the necessity of adopting safety measures.

In order to determine more definitely the relation of electric lamp equipment to dust explosions and fires, the United States Bureau of Chemistry and the United States Grain Corp. have been co-operating in these investigations with some of the lamp manufacturing companies. Most of the experimental work has been conducted in the laboratories of the National Lamp Works at Cleveland. The tests have shown much regarding the conditions under which dust explosions can be produced by breaking the electric lamps in dust clouds. They prove that this may occur irrespective of the type of the lamp. The lamps should be protected with vapor-proof equipment and be well guarded so that they cannot be easily broken.

Fires Originating From Dust on Electric Lamps.

Fires have originated in grain elevators from dust collecting on electric lamp globes. If the lamps are located in dusty parts of the plant the dust may accumulate on the globe and become



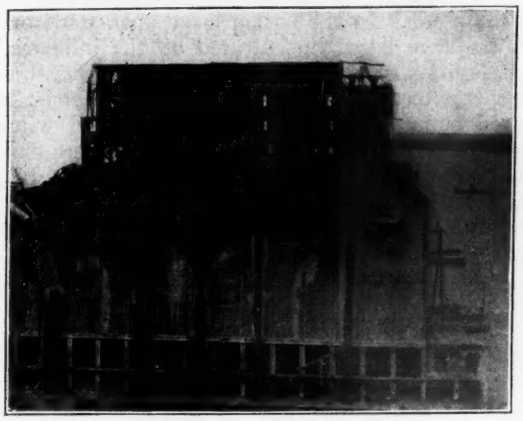
Wiring System for Conducting Static Electricity From Grain Threshing Machines.

heated to the point of incandescence. By falling onto combustible material on the floor a fire may result. A number of instances of this nature have been brought to the attention of the field engineers of the Bureau. This may account for some of the fires of "mysterious origin" in the large grain elevators of this country during recent months. The lamps should not be allowed to become thickly coated with dust because of the

[2]Report on the "Inflammability and Capacity for Transmitting Explosions of Carbonaceous Dust Liable to be Generated on Premises," under the Factory and Workshop Acts, 1913. R. V. Wheeler, D. Sc.

dangers of fire and because of the loss of illumination.

Static electricity has appeared prominently as a cause of a large number of dust explosions and fires. In the Pacific Northwest disastrous losses have been experienced from dust explosions in threshing machines during their operation in the



Grain Elevator in Canada Badly Damaged by Dust Explosion and Fire.

harvest fields. Owing to the very favorable climatic conditions in that territory, with exceptionally low humidity and high temperature, large quantities of static electricity accumulate and are redistributed during the operation of the threshing machine. The wheat in that territory is infected with "bunt or stinking smut," the dust of which is very flammable. It has been found that sparks of static electricity will ignite the smut dust, resulting in explosion and fire. A complete system to conduct the static electricity to a common ground rod has been designed and proven effective.

Static Electricity the Cause of Numerous Explosions.

A special study of frequent fires in cotton gins in the South developed much the same phenomena. The investigators found that the rubbing of cotton on the surfaces of the galvanized pipes leading to the gins produced charges of static electricity sufficient to ignite the cotton. A grounding system for the control of the static electricity has given effective results. The two distinct cases referred to are especially significant when it is considered that in a single season in the Pacific Northwest upwards of 500 explosions occurred, while in Texas and Oklahoma there were about 600 cotton gins that experienced fires in a similar period.

Static electricity as a cause of dust explosions in grain milling plants has appeared prominently in recent investigations. The friction of finely divided materials, with low moisture content, on wire screens or gauzes in certain types of milling equipment (rolls and sieves particularly) has permitted static electricity to accumulate, which results in the ignition of the dust on the interior of the equipment. A similar source of ignition may be presented by high-speed pulleys and belts operating in dusty atmospheres. The necessity for efficient grounding methods to prevent dust ignition from electric sparks of this nature has been clearly indicated.

Equipment affording additional safety is now being developed, which it is felt will reduce the possibility of dust explosion by the breaking of electric light globes, and the other electrical sources referred to in this article. The electrical causes of dust explosions, although recently determined, can be properly taken care of by safety measures. In many instances defective installations combined with bad practice have resulted in dust ignition by electrical sources. It is desired to bring the matter to the attention of the electrical engineers in the industrial plants in order that the hazard may be fully recognized and preventive methods adopted.

ANNOUNCES CONSTRUCTIVE ADVERTISING POLICY.

Square D Co. to Change Its Advertising Copy From Negative to Positive Appeal—Campaign for Inclosed Switches in the Home.

"We certainly have stirred up a warm controversy with our 1920 advertising, and I am glad of a chance to explain to the electrical trade why we found it necessary to employ so-called negative copy and why we feel now that the time has come to change to a positive type of appeal," said A. MacLachlan, secretary and director of sales of the Square D Co., Detroit, in an interview with an Electrical Review representative recently.

"When the question of nationally advertising Square D safety switches was first discussed, we were confronted by an unprecedented situation. We were manufacturing an article whose sale was dependent not only upon the stability of the entire electrical industry but on the creation of a new buying habit. It was not difficult to see that any propaganda harmful to the better interests of the industry as a whole would, if persisted in, affect the market for safety switches along with other devices used in the consumption, transmission, distribution and production of electricity.

"On the other hand, the sale of the product was directly dependent upon a real appreciation of the danger connected with the use of the open knife switch. If the public refused to realize the danger offered by such switches and the industry made no attempt to throw out the open knife switch, or take the responsibility, safety switches could not be universally adopted. If, however, the danger was brought to the public's attention the matter of replacing dangerous switches by safety switches would resolve itself into a problem of production and distribution rather than of creating demand.

"If the 'unforgettable manner' had been any form of publicity other than negative copy, the problem would not have been greatly different than the problem confronting the average manufacturer contemplating national advertising. But negative copy was the only unforgettable one available for a pioneer industry manufacturing a safety device. Although the officials of the Square D Co. were aware that its choice by them would result in criticism, they decided to use this appeal.

"We understood from the start," continued Mr. MacLachlan, "that our use of negative copy could be only temporary at best. But we had to shock the public into a realization of the danger of the

open knife switch, a device admitted even by the industry to be dangerous. We had to accomplish in a few months what the whole industry would have, by less dramatic methods, taken ten years to do. And in those years many lives would have been sacrificed. The public—especially those portions of it not personally concerned in the safeguarding of dangerous machinery—suffers from the habit of procrastination. An appeal other than that of fear would have suggested to factory owners and managers that the open knife switch was dangerous; but the suggestion would either have been forgotten or put off. But the negative appeal drove the fact deep into their consciousness. And while the campaign may have caused some timorous people to believe that the unusual cases portrayed in our advertising were commonplace wherever electricity was used, it cannot be denied that it saved hundreds of lives by causing manufacturers to scrap their open knife switches and replace them with safety switches.

"It was suggested that the appeal we have discarded left the layman with an impression that accidents were inevitable wherever electricity was used, and that the industry was thereby injured, but we have yet to find one specific instance when the sale of an electrical device or appliance has been affected by such an impression.

"When our national advertising campaign based on the negative appeal was instituted we had no idea how long it would be before it would serve its purpose and a less striking appeal could be used. We were pioneering and we expected to be criticised.

"At any time it would have been far easier to stop the criticism by forsaking the negative and abruptly changing to positive copy. But once we had chosen our course we could not leave it until we reached our objective. The nation-wide interest in Square D switches and all other makes of safety switches is the most convincing proof possible that the copy did strikingly drive home the need for an inclosed, externally operated safety switch.

"Several months ago we began to feel that the country had been sufficiently aroused in a manner that would facilitate the sale of safety switches. At this time we went to the jobbers and the contractors for advice. A great many of them agreed that while our copy did aggravate electrical merchants it had attained the desired ends in arousing public opinion; and they also were sincere in advising us that the time had come to do away with the negative appeal. We determined to leave the time to change to their judgment. The result is a complete change in our next year's campaign.

"The new campaign will be one that will without a doubt meet with the approval of the entire industry. Instead of building an appeal on tragic, dramatic accidents—even though founded on fact—we will by analogy entirely removed from the electrical industry show how Square D switches prevent the accidents that are bound to happen as long as open knife switches are permitted to make electricity dangerous. We will bring out more strongly than ever the fact that we have always stressed that it is the open knife switch rather than the electricity that is the source of grief and horror. The pictorial display in our advertising will be dramatic, but it will in no way have any connection with the use of electricity. Rather, its purpose will be to instantly convey to the reader that safety switches are a safeguard, and in this manner promote the use of electricity rather than retard it.

"Portions of our national campaign will be directed toward the installation of safety switches in the home. In the past a large portion of our efforts have been concentrated on the industrial installations of safety switches, but an investigation convinced us that almost every electrically wired home in America is ready for the switch which can be safely used where women and children are. To complete the installation is only a matter of education. The same basic principle will rule in this domestic educational campaign—that of reassuring and helpful analogy.

"We realize that the industry has had reasons for its criticism of our advertising. We feel that their criticism has been a large factor toward focusing professional opinion on the dangers of the open knife switch and the advantages of the safety switch. And we also feel that the industry, now that we have frankly stated our position, will admit that while we may have been enterprising, we were, in a large measure, right; and that it will be watching for our new campaign with a great deal of interest."

TIDAL WATERS TO PROVIDE MILLION HORSEPOWER TO BRITAIN.

A scheme to develop 1,000,000 hp. by tidal waters has just been made public in Great Britain. The project has been planned by Sir Alexander Gibbs, chief engineer of ports construction and the builder of the world-famed naval dock at Rosyth, and proposes to harness the Severn river.

The plan as made public consists of building a concrete dam across the mouth of the river, which is nearly 7 mi. wide at one point, and creating a storage basin. This dam would be fitted with locks for permitting the entry and exit of ships and the entry and storage of tidal waters. The work involved would take 7 years, it is estimated. About 1,000,000 hp. would be developed at maximum tidal flow.

The Severn river partly divides England from Wales. In the spring the Severn rises 38 ft., this tide being the next highest after that in the Bay of Fundy. If the project matures, it is believed that the top of the dam may be used for railroad tracks, thus permitting trains to pass along the dam instead of through the Severn Tunnel as they do at present. About 4,000,000 tons of coal would be conserved annually by the use of the tidal waters, it is estimated.

OUTPUT OF ELECTRICAL ENERGY SHOWS INCREASE.

The New Jersey Power & Light Co. reports its operating revenue for the month of November, 1920, the highest of any previous month and an increase of 33.2% over the same month of last year. The kilowatt-hour generation for last November showed an increase of 20.3% over the output for November, 1919, and it is expected that the December records will exceed even this amount.

EDITORIAL COMMENT

Getting Electrical Men and Builders Together

There was a new business beacon lighted for the guidance of the electrical contractor the other day when the secretary of the Wisconsin Master Builders' Association attended a convention of Wisconsin Electrical Contractors and Dealers and invited them to join the builders for the purpose of co-operation in matters of economic construction, industrial problems and legislative influence. The electrical men promptly responded with a resolution calling upon the various community associations of contractor-dealers to take steps toward affiliation with the branches of master builders in their respective localities.

This is an obvious step forward for both the electrical men and the building contractors. In most instances the electrical contractor who does the electrical installation in new buildings is a sub-contractor under the master builder who has the general contract for the construction. How much more pleasant and profitable would the relationship be if the electrical contractor could meet on a common footing with the building contractor and architect in joint consultation, exchanging data, ideas and suggestions before proceeding with the construction. Wisconsin has set a precedent worthy of consideration by contractor-dealers of other states.

Abolishing Commission Regulation of Utilities

The recent recommendation of the new governor of Illinois that the State Public Utilities Commission be abolished brought forth an immediate protest from all over the country. Governors of other states, business organizations and public and private citizens voiced their approval of both the theory and practice of commission regulation of utilities.

With business going through a general reorganization it would seem that the present time was not particularly opportune to undertake a complete change in the method of public-utility regulation. The utility law, if not entirely satisfactory, can be revised from time to time as required. If the personnel of the commission is not satisfactory. it can be changed without difficulty. But if the entire scheme of regulation is discarded so that the utility companies of the state are confronted with a period of uncertainty and confusion the difficulty of stabilizing business in general will surely be increased. The public utilities of a community are an important business of themselves, and with their influence in other forms of enterprise comprise a most vital part of the business structure of the country. It is, indeed, to be hoped that a most careful consideration will be given before any proposition is adopted that is liable to result in undermining the stability of the public utilities of the country.

Electrotherapeutic Apparatus

Electrical contractor-dealers are working persistently toward the goal of "Electrical Goods for Electrical Stores." The merchandising of electrical appliances and equipment by electrical contractors is still in its infancy even if the infant is a big, healthy prodigy. There is quite a distance to travel in the path of progress before the contractor-dealer has achieved his aim to control the retailing of all electrical appliances. Eventually that goal will be reached. For the present it is pretty generally understood that the manufacturers of electrical appliances are well ahead of the development of electrical retail stores. The manufacturers must find an outlet for their products. That is the reason so many electrical appliances are sold in drug and department stores, and in other stores that do not employ electricians or maintain electrical service.

It is only recently that violet-ray generators, vibrators and other electrotherapeutic apparatus have found their way into the stores of electrical contractor-dealers. The number of devices in this line adapted to household use is limited to a certain extent, but the electrical dealers who have tried them out have found that they open up a comparatively new field in which the investment and overhead are small and the turnover rapid and profitable. These devices intended for the improvement of health and beauty not only sell readily to old customers of the electrical dealer, but they bring in custom from others who are fast learning to buy things electrical from electrical stores. Another worthy feature is that no matter how hard the times or how much business may suffer from periodic depressions, the low cost and the appeal to vanity and "self-coddling" in all human nature makes the electrotherapeutic apparatus sell where labor-saving electrical appliances go begging.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

LIGHTING FIXTURE DEALERS WILL MEET IN BUFFALO.

Organization's Annual Convention to Be Held During Buffalo Fixture Market Week—Costs and Overhead to Be Discussed.

The annual convention of the Lighting Fixture Dealers Society of America will be held during the Buffalo fixture market week, Feb. 14-19. The business sessions will be held at the Hotel Iroquois, and joint luncheons with the National Council of Lighting Fixture Manufacturers and the illuminating Glassware Guild will be held each day, commencing with Tuesday.

The program for the business sessions of the Lighting Fixture Dealers Society follows:

Monday Morning and Afternoon.—Executive board meeting.

Monday Evening.—Round table chat by early arrivals.

Tuesday Morning.—Registration on the first floor of Hotel Iroquois; meeting called to order by President Netting; announcement by President Hadley of the Lighting Fixture Dealers Club of Buffalo; address of welcome by Arthur Kreinhader, city representative; six 5-min. talks by the presidents of local clubs; appointment of committees by President Netting; round table discussion.

Wednesday Morning.—Report of manufacturers' committee; address by President Farmer of the National Council of Lighting Fixture Manufacturers.

Wednesday Evening.—Banquet and entertainment.

Thursday Morning.—Report of glass manufacturers' committee; address by Mr. Blumenauer, representing the Illuminating Glassware Guild; talk on work of the Illuminating Engineering Society by speaker to be furnished by the I. E. S.; addresses by G. F. Laube and M. H. Salmon on the subject of costs, overhead, turnover, gross sales, investments, profits, etc.

Friday Morning.—Reports of committees; miscellaneous matters; unfinished and new business and election of officers.

WASHING MACHINE MANUFACTURERS CONVENE.

American Association Discusses Distribution Problems at Annual Convention—Increase Reported in Use of Electrically Operated Equipment.

The general problems of distribution of washing machines through various channels were among the important topics discussed at the annual convention of the American Washing Machine Manufacturers' Association held in Chicago, Jan. 19-20. It was brought out in the reports of officers that 1920 was a seller's market, but since the new year opened conditions have changed around to a buyer's market. Progress was reported in the movement undertaken by the association to widen the market for washing machines through educational propaganda, such work being conducted for the direct benefit of the distributors' selling agencies.

Reports from members indicated a gradual increase in the volume of business since November last, when the lowest point was reached, the improvement in the demand being especially noticeable since the first of the year. Figures submitted at the convention showed that $85,000,000 worth of business was done last year, an increase of 70% over 1919, with a marked increase in the units of electrically operated equipment. There were probably twice as many electric washing machines sold in 1920 as in the previous year.

The following officers were elected for the ensuing year: President, R. D. Hunt, Dexter Co., Fairfield, Ia; first vice-president, W. J. Conlon, Conlon Electric Washer Co., Chicago; second vice-president, J. P. Moynihan, Blackstone Manufacturing Co., Jamestown, N. Y.; third vice-president, Silas W. Altorfer, Altorfer Bros. Co., Peoria, Ill.; treasurer, W. H. Voss, Boss Brothers Manufacturing Co., Davenport, Ia.; secretary, E. B. Seitz, Otis Building, Chicago. Executive committee, H. W. Power, H. F. Brammer Manufacturing Co., Davenport, Ia.; J. D. A. Johnson, Michigan Washing Machine Co., Muskegon, Mich.; E. H. Maytag, Maytag Co., Newton, Ia.; L. A. Dietz, Boss Washing Machine Co., Cincinnati, O., and F. H. Bergman, One Minute Manufacturing Co., Newton, Ia.

PROGRESS MADE IN N. E. L. A. ADVERTISING CAMPAIGN.

Association Issues Schedule on Good-Will Advertisements Covering Central-Stations' Problems and Names Companies Participating.

The co-operative advertising campaign being conducted by the National Electric Light Association, and in which manufacturers of electrical machinery, equipment and supplies are participating, is making progress. George F. Oxley, director of publicity, N. E. L. A., in a letter sent out from National headquarters Jan. 19 to member company executives, states that the association's own advertising campaign will begin Feb. 19 with a one-half page advertisement in the *Saturday Evening Post,* to be followed by 12 similar advertisements to appear in subsequent issues of the same magazine at intervals throughout the year.

The first of the manufacturers' advertising in popular magazines will appear Jan. 29 in *Collier's Weekly,* and during the months of February and March other good-will advertisements, written about the central-stations' problem, will appear in the *Literary Digest, American Magazine, Saturday Evening Post* and *Collier's Weekly* over the individual firm name of the company donating the space, as follows: General Electric Co., Westinghouse Electric & Manufacturing Co., Western Electric Co., Wagner Electric Manufacturing Co. and the Nela Research Laboratories, Cleveland. The Robbins & Myers Co. will utilize quarter-

page space in local newspapers published in 12 cities scattered throughout the country. Space in national popular magazines will be used by the Hoover Suction Sweeper Co., Edison Electric Appliance Co., Habirshaw Electric Cable Co., Duplexalite Co. and the Hurley Machine Co.

The following additional companies have agreed to use space in the trade journals:

Trumbull Electric Manufacturing Co., Plainville, Conn.; Hygrade Lamp Co., Salem, Mass.; Condit Electrical Manufacturing Co., South Boston, Mass.; Kuhlman Electric Co., Bay City, Mich.; Burke Electric Co., Erie, Pa.; Electric Storage Battery Co., Philadelphia; Majestic Electric Development Co., Philadelphia; Locomotive Electric Washing Machine Co., Belleville, Ill.; Federal Electric Co., Chicago; Sangamo Electric Co., Springfield, Ill.; Moloney Electric Co., St. Louis; Roller-Smith Co., New York City; Power Specialty Co., New York City; Westinghouse Lamp Co., New York City; Packard Electric Co., Warren, O.; Canadian Westinghouse Co., Ltd., Hamilton, Ont.; Hamilton-Beach Manufacturing Co., Racine, Wis.; Syracuse (N. Y.) Washing Machine Corp.; Comas Cigarette Machine Corp., Salem, Va.; Britton & Doyle, Cleveland; Jeffery-Dewitt Insulator Co., Huntington, W. Va.; P. A. Geier Co., Cleveland; Anaconda Copper Mining Co., Chicago; Domestic Electric Co., Cleveland; *Electrical World,* New York City, and ELECTRICAL REVIEW, Chicago.

ELECTRICAL CONTRACTOR-DEALERS OF OHIO MEET IN CANTON.

Dealer's Margins, Industrial and Overhead Costs Among Subjects Discussed at January Meeting of Ohio State Association.

The outstanding features of the meeting of the Ohio State Association of Electrical Contractors and Dealers held in Canton, O., Jan. 18-19, were the discussions on dealer's margins and industrial costs. The membership of the association feels that the dealers ought to have at least a 33.33% margin, and an effort is being made to induce the manufacturers to increase the dealer's margin before reducing the retail cost. The convention also showed a genuine interest in cost matters.

A. G. Loughborough, Cincinnati sales manager of the Western Electric Co., submitted a paper on "What Your Jobber Can Do for You," in which he divided the subject into four divisions, viz., investment, sales and sales service, credits and service. This was followed by a round-table discussion. An address was given by George Hartke, of Ernst & Ernst, Pittsburgh, on the "Value of Knowing Your Overhead." The speaker pointed out the necessity of carefully keeping a cost record and the need of properly applying costs. He urged electrical contractors and dealers to consider accounting as a productive expense. Frank D. Van Winkle, Post-Glover Electric Co., Cincinnati, spoke on "The Development of the Electrical Industry in 1921," stating that the electrical trade should concentrate its thoughts on home-building. He said further that with the increased use of farm-lighting outfits and the spreading out of high potential rural lines, practically every home becomes a possible user of electric light and power, and a prospective purchaser of electrical appliances.

At the banquet W. S. Viall, merchandising specialist of the General Electric Co., spoke on the subject of "Making the Store Sell the Idea," and submitted charts to convey the methods which he outlined. Mr. Viall advocated the establishment of electrical stores along such lines that they will be so attractive to the buying public that the sale of electrical appliances soon will be confined to special electrical stores.

The following officers were elected: State chairman, Claude Wall, Akron; state secretary, Walter R. Keefer, Cincinnati, and treasurer, Fred Werk, Cleveland. Executive committee, R. J. Vincent, Canton; P. J. McMerny, Cleveland; Claude Wall, Akron; John Becker, Cincinnati, and A. O. Robbins, Columbus.

GENERAL ELECTRIC BUYS INDEPENDENT PROPERTIES.

As a result of the suit over the Coolidge patent for drawn-tungsten wire, which was decided some time ago in favor of the General Electric Co., the lamp and wire plants of the Independent Lamp & Wire Co. at Weehawken, N. J., and York, Pa., have been purchased and are now being operated by the General Electric Co. One-third of the stock of the Independent company was owned by the General Motors Co., which took about 10% of its lamp output, which in 1920 amounted to about 9,000,000 lamps. At the time the General Electric Co. offered the independent lamp manufacturers licenses under the Just and Hanaman patent the Independent Lamp & Wire Co. refused to take one out and continued to manufacture unlicensed lamps until the United States District Court in the resulting litigation decided in favor of the General Electric Co.

ELECTRICAL INSPECTORS HOLD CONVENTION IN DETROIT.

Western Association Discusses Transformer Problems, Fixture-Wire Insulation and Electrical Inspection Ordinances at Annual Meeting.

Greater individual activity in solving inspection problems was urged by President K. W. Adkins at the sixteenth annual meeting of the Western Association of Electrical Inspectors, held at the Hotel Statler, Detroit, Jan. 25-28. Vice-president St. John, Detroit Electric Furnace Co., illustrated the economy and utility of the electric furnace by motion pictures and stated that increased cost of power was more than offset by the saving in efficiency making commercially possible electric steel, carborundum and other products.

General Agent George B. Muldaur, Underwriters' Laboratories, Chicago, urged inspectors to make greater use of the laboratory in connection with inspection problems. Hubert J. Clark, engineer of the Oklahoma Inspection Bureau, Oklahoma City, in speaking on the subject of "Transformer Values—Location, Construction and Equipment," advocated the construction of transformer vaults of fire resistive material, with a provision for adequate ventilation and drainage, together with sufficient room for inspection and repairs. In the discussion which followed, W. L. Granger, engineer of the Detroit Edison Co., advised against transformer vaults because the additional apparatus needed introduced complications. No transformer fires have occurred in Detroit, as transformers are mostly outside of buildings in that city. F. A. Barron, engineer of

the General Electrical Co., brought out the fact that the grounding of transformer secondaries as a safety measure was known in 1885, and lantern slides were shown of the early inventions of Professor Thomas in alternating-current machinery and protective grounding devices.

A. A. Meyers, electrical engineer of the Detroit Edison Co., outlined the precautions taken by his company to safeguard customers from high-voltage shock by grounding secondaries at transformers. It was pointed out by W. J. Canada, director of engineering of the National Electric Light Association, that the grounding rules of the National Electrical Code were satisfactory except in minor details, but that the arrangement of the Code rules could be very much improved.

Ernest McCleary, Detroit, stated that the contractor working under plans and specifications of an engineer or architect could not be held responsible for safety, but where the contractor was in full charge of the installation he was in duty bound to establish safe conditions.

Charles H. Hofrichter, secretary-treasurer of the National Council of Lighting Fixture Manufacturers, frankly acknowledged the shortcomings of the fixture industry, saying that the trouble was partly due to an attempt to serve two masters—gas and electricity. The industry is purging itself and reversing its old method. A committee of inspectors will meet a committee of fixture manufacturers and dealers in the near future to discuss fixture problems. Dana Pierce, vice-president of the Underwriters' Laboratories, New York City, said that a factory inspection service covering a few reputable fixture makers would not force the small manufacturer into line. The reform must come from within the industry.

A note of optimism was sounded by J. L. Wolf, secretary of the Lighting Fixture Dealers' Association of America, Detroit, when he outlined the method used in bringing the fixture manufacturers and glassware people together to make shades that would fit shadeholders, etc. In Cleveland fixture hangers are remunerated on a basis of the care used in hanging fixtures, as determined by a demerit system administered by an inspection department maintained by the dealers' association.

Victor H. Tousley, chief electrical inspector, Chicago, protested against the tendency toward reducing the thickness of insulation on fixture wire. He said that Chicago would probably require 1/32-in. rubber on all fixture wires. A resolution was adopted urging that fixture wires have not less than 1/32-in. rubber insulation.

In his address on the "Effect of Electrical Inspection and Municipal Fire Alarm Systems on Fire Insurance Rates," F. A. Raymond, engineer of the National Board of Fire Underwriters, New York City, declared that poor electrical ordinances and poorly enforced electrical ordinances tended to increase fire hazards, and a defective fire-alarm system increased the chances for delays in summoning the fire department in case of necessity. Ben W. Clark, chief electrical inspector of Detroit, indicated that careful and systematic reinspection of old wiring benefited the city and its industries.

Frank R. Daniel, chief engineer of the Wisconsin Inspection Bureau, Milwaukee stated that helpful co-operation with contractors, public service companies and municipal departments, together with the education of contractors and journeymen, had proved helpful in securing the removal of dangerous wiring installations.

In speaking on the subject of "The Central Station's Co-operation," L. D. Smith, general superintendent of the Minneapolis General Electric Co., stated that central-station employes should report bad wiring conditions to the municipal authorities and a prompt inspection should follow the receipt of the report.

Thursday's sessions were devoted to various committee reports and the election of officers.

FORMER OFFICERS RE-ELECTED AT DEALERS' MEETING.

Wisconsin Association of Electrical Contractors and Dealers Enlarge Program of Annual Convention With Discussions.

Wisconsin Association of Electrical Contractors and Dealers re-elected the officers of the past year at a business session of the annual convention in Milwaukee Jan. 20. The officers are: Chairman, B. L. Burdick, president of the Burdick Electric Co., Milwaukee; secretary, H. M. Northrup, assistant sales manager of the G. Q. Electric Co., Milwaukee; treasurer, John L. Acker, of the Acker Electrical Co., Sheboygan, Wis. The executive committee is as follows: Milwaukee district, O. H. Uihlein, of the Uihlein-Ortman Electric Co., Milwaukee; La Crosse district, J. J. Kelley, of the Kelley Construction Co., Eau Claire, Wis.; Madison district, L. W. Burch, of the Electrical Supply Co., Madison, Wis.; Oshkosh district, W. F. Meter, of the Meter Electric Construction Co., Oshkosh, Wis.; Racine district, Hans Larsen, electrical contractor, Racine, Wis.; Sheboygan district, J. L. Acker, of the Acker Electrical Co., Sheboygan, Wis.; Wausau district, George Spiegel, of Spiegel's Electric Shop, Clintonville, Wis.; Superior district, L. G. Ross, electrical contractor, Superior, Wis.

Members of the association received notice that the new Wisconsin Industrial Commission has made some important revisions in the industrial electrical code which compels some changes in old installations. The commission has put it up to the electrical contractors of the state to carry out the provisions of the code.

During a discussion of the subject of co-operation with central-station companies it was suggested that contractor-dealers should know the rates of their respective central-station companies as they apply to new or prospective installations. They could get the work more readily and at the same time be selling central-station service. One contractor said he always took his plans and specifications to the superintendent of the central-station company to see if there were any criticisms. It was explained that this kind of co-operation would prevent installations which the power plant could not serve without changes in motors or other equipment. It would also prevent complaints of such customers as to the size of their bill for electrical energy.

E. E. Garlits, of the Westinghouse Electric & Manufacturing Co., employed a blackboard to

illustrate his points in regard to the "Turnover Cycle" of the appliance dealer. His subject, "The Contractor-Dealer of Tomorrow," was ably employed to give the dealers pointed advice in carrying out the four divisions of the turnover cycle under the headings, "Sounding out the field," "Supplying the material," "Getting the goods to the customer," and Management—"Getting the money."

A. A. Gray, advertising counselor, Chicago, was a surprise number on the program. He came by special invitation to talk to the association on "Looking Into the Future in the Development of the Electrical Industry." A. Penn Denton, Kansas City, member of the executive committee of the National Association of Electrical Contractors and Dealers, outlined the accomplishments and future objectives of the national organization. He said the association was committed to the open shop and admonished local contractor-dealer organizations to refer to the labor committee of the national association all labor contracts with local electrical labor organizations before closing with them. The national committee, Mr. Denton said, is charged with promoting uniform labor conditions throughout the country.

WORK OF TECHNICAL SECTION, N. E. L. A., REVIEWED.

Executive Committee Discusses Activities of Geographic Division Technical Sections—Representatives Appointed to Study Temper-

Reports made Jan. 19 to the executive committee of the technical national section, N. E. L. A., indicate that the work of the technical section is being carried out actively through the co-operation of the several technical committees of the geographic divisions. Chairman I. E. Moultrop announced that although methods of co-operation pursued are not yet uniform in all respects progress toward uniformity is satisfactory.

A chart showing the relations of the geographic division technical section, presented by L. M. Klauber, San Diego (Cal.) Consolidated Gas & Electric Co., was discussed and approved. It is planned to have this chart and the explanatory material reproduced and copies forwarded to all geographic divisions for the information of their officers.

After discussion the committee recommended that the safety rules committee should prepare a statement conveying to the Bureau of Standards the latest information gained by the electrical apparatus committee of the technical section with regard to the relative hazards of oil-filled apparatus, and to advise the Bureau as a matter of courtesy and frank co-operation that restrictive rules in the Safety Code appear warranted, although these rules previously were objected to by the committee as not warranted by the experience then in hand. The Bureau is to be urged that these rules should be phrased in such a way as to take into consideration factors not adequately considered in rules previously proposed by the Bureau for the Safety Code.

Messrs. Tapscott, Albrecht and Elden were appointed as N. E. L. A. representatives on a joint committee to be composed of representatives from several societies operating under the auspices of the standardization committee, American Institute of Electrical Engineers, for the purpose of determining American standards for temperature limits of insulation of electrical apparatus. The extent of activities of representatives of the N. E. L. A. upon this joint committee will be determined followed the issuing of a statement regarding the scope of the work to be carried on.

Chairman Moultrop reported that conferences are being held with engineer representatives of the American Telephone & Telegraph Co., with a view to co-operative dealing on mutual inductive interference problems.

At the third meeting of the inductive interference committee this year, held Jan. 18, new members were appointed as follows: W. E. Beaty, Union Gas & Electric Co., Cincinnati; P. H. Chase, American Railways Co., Philadelphia; G. C. Neff, Wisconsin River Power Co., Madison, Wis., and J. B. Thomas, Texas Power & Light Co., Dallas, Tex., succeeding E. B. Neiswanger of the same company.

Routine reports of progress were made at the sessions of the meter committee Jan. 19-20, 26 members, including representatives from all sections of the country, being present.

A. I. E. E. DISCUSSES POWER IN RUBBER INDUSTRY.

The technical session of the American Institute of Electrical Engineers, held in Cleveland Jan. 14 under the auspices of the Cleveland and Akron sections and the industrial and domestic power subcommittee on the rubber industry, was devoted to the subject of the "Application of Electric Power in the Rubber Industry."

The advisability of grouping the units of any one process into one mill drive, where possible, was suggested in the subcommittee's report, which also stated that the units should have contrasting characteristics to improve motor-load factors and thus avoid the tendency toward overmotoring that exists where the individual drive is utilized. The use of synchronous motors was advocated, one speaker stating that poor power-factor conditions were due to some extent to underloaded motors and that the larger sized motors could be used advantageously in many cases. W. S. Scott, in discussing the subject of industrial heating, said that the future demand might be as great for power for this purpose as for motor applications.

DISCUSS RELAYS AT SIGNAL SECTION MEETING.

"Alternating-Current Track Circuits" was the subject of a paper presented by Louis F. Vieillard, electrical inspector of the Long Island Railroad Co., at the meeting of the signal section of the New York sectional committee, American Railway Association, Jan. 20 at the Hotel McAlpin, New York City. The subject of relays was treated in detail and the signal relay was termed the most important device in an a-c. track circuit, since the safety of many lives depends upon its proper operation, and, therefore, thorough testing of this apparatus is essential.

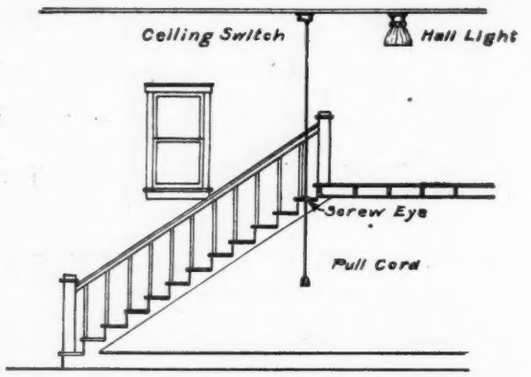
CONTRACTING-CONSTRUCTION

A Department Devoted to Various Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

SUBSTITUTE FOR A SET OF THREE-WAY SWITCHES.

By H. S. Rush.

One of the most useful switch control features which can be used in the residence wiring job is the three-way switch control for the upstairs hall light from two points, one upstairs and one downstairs. In the small residence these convenient switches are often omitted as an expense



Single Pull Switch Mounted to Work From Two Floors.

which cannot be afforded. At a small cost many of the advantages of a set of three-way switches can be secured by placing the upstairs hall light on a ceiling pull-cord switch so placed that the cord may be conveniently reached both upstairs and downstairs. Where the cord cannot be dropped directly from the second floor ceiling to the first floor the cord can often be carried along the wall of the stairway, using small screw eyes as guides.

PORTLAND REARRANGES ELECTRIC INSTALLATION CODE.

Radical Departure From Old Arrangement and Grouping of Rules Made to Simplify Code for Electricians in Oregon Metropolis.

A new electrical code recently passed by the city of Portland, Ore., should be of interest to electrical engineers, inspectors and the electrical trade generally. The National Electrical Code, which is a general basis of legislation for the cities of this country, was taken to be not worded conveniently for a municipal ordinance, but as a book of rules for an inspection department. The arrangement of the subject matter has varied little during the past 20 years, and, although it serves very well in the hands of the inspector whose entire time is devoted to its enforcement, yet it was considered to be a somewhat difficult text for the average wireman or contractor to follow. In the new Portland code, an attempt has been made to arrange the rules and group and classify the subject matter in such a manner that the user may readily find the particular regulations governing the work in hand.

The new arrangement is logical in that each part includes as far as possible all of the regulations governing the class of work in question, and the order of the subject treated is such that each succeeding section can be readily understood without reference to any section following. The different sections are emphasized by the use of subheads set in large type. Notable besides arrangement in the new code are the regulations for motors, the inclusion of life hazard regulations and of a complete index. The code is printed in loose leaf form and is of pocket size. It is the work of L. W. Going, acting chief inspector in the electrical division of the bureau of buildings, working in co-operation with a committee of electrical contractors and engineers.

The Portland code is divided into parts, as follows:

Part I of the new code relates to the administrative provisions, including requirements for permits, licenses, inspections and fees; also provisions for board of examiners and board of appeal.

Part II includes definitions and general requirements. The definitions are arranged alphabetically and include those terms over which some difficulty in interpretation might arise.

Part III includes the installation of conductors, and gives the general and special rules governing the classes of work and the locations where each class of work may be used. The installation of conductors for both low and high-potential systems is covered.

Part IV includes the requirements for protective grounding of circuits and equipment.

Part V relates to the installation of switches, cut-outs and cabinets, these three items being related to each other in a sense that they are usually combined in any installation.

Part VI governs the installation of services and meters. Owing to the large number of special requirements included in the rules relating to this part of an electrical installation, it was thought best to group these regulations in one part of the code.

Part VII includes the rules for the installation and wiring of equipment. Power equipment is covered first, including generators, switchboards, transformers, motors, elevator and crane wiring, etc. As the service supply in Portland is limited to single and three-phase a-c. systems, and to 110 and 550-volt d-c. systems, it was found practicable to provide a complete set of motor-wiring tables, which facilitates greatly the lay-out of constant-duty motor installations. The tables cover both the 40-deg. and 50-deg. motors, this being found necessary owing to the large number of 40-deg. motors in use. Immediately following power equipment are the rules governing the installation of heating appliances. Lighting installations are next taken up, including the requirements for wattage capacities of circuits for different classes of installations, the installation and construction of fixtures and the use of sockets, receptacles and flexible cord. The requirements for isolated light and power equipments and radio signaling apparatus are also included.

Part VIII contains wiring requirements for buildings of certain occupancies, such as garages, exposition buildings, theaters, assembly halls, motion picture factories, studios and exchanges.

Part IX governs the installation of signaling sys-

tems, including telephone, telegraph, district messenger and call-bell circuits, and fire and burglar alarms.

Part X gives the requirements for electrical driving and control of fire pumps.

COMMENTS ON ELECTRICAL CONSTRUCTION PRACTICE.

Fire-Pump Motors Require Particular Attention in Installation of Circuits—Oil and Grease Objectionable as Lubricant for Pulling Wires Into Conduit.

The installation of fire-pump connections without fuse protection will necessitate the taking of special precautions to assure safety of service after May 1st, 1921, according to the Bureau of Electrical Inspection of Chicago. The following extracts from a recent *Bulletin* of the bureau covers this and other points of importance:

"Fire-Pump Motors.—The rules of this department accept the installation of fire-pump motors where the mains are run with lead-covered wires in conduit continuous (except for meter connection) from the entrance of the service wire to the motor panel. On account of the importance of constant connection to the apparatus supplied the usual service switch and fuse are allowed to be omitted. Beginning May 1st, 1921, the department will require that conduits containing mains for fire-pump motors shall either be placed underground or shall be incased in at least 3 ins. of concrete, where such mains are not protected by fuses.

"Moving Picture Booths.—Rule 38u, 9, requires that booths for the installation of moving picture machines must be 'constructed to conform to the existing ordinances of the department of buildings.' The ordinances of the building department which permitted temporary installation of moving picture machines in sheet metal or other temporary booths has been repealed. At the present time the ordinance permits a standard picture machine, whether of permanent or temporary nature, only in fireproof booths of brick, tile or concrete. Sheet metal and other types of temporary booths are in violation of the ordinance.

"Poor Work in Cutout Boxes.—On a recent tour of inspection made by a visitor to this city he reported that he found many instances of what might otherwise have been considered good installations, but which lost their right to such title by the character of work around the cutout boxes. The present rules of the department provide the means—both in appliances and methods of wiring—whereby a complete, efficient and neat electrical installation can be made, and it reflects on the reputation of any contractor to have any part of his electrical installation in such a condition as to be termed 'sloppy.' The reputation of this city for its electrical work is very high, and it devolves upon the wireman and contractor to keep it so.

"Oil and Grease on Wires.—Oil or grease must not be used for the 'pulling in' of wires in conduit. Both of these lubricants have a very bad effect on the insulation in that they destroy the rubber compound. Inspectors are instructed to require the removal of all wires on which oil or grease has been used.

"Connecting Electric Signs.—Where newly erected signs are connected to previously installed mains the sign company will be held responsible for the condition of these mains. Connection should not be made unless the mains referred to are of sufficient capacity, in good condition, and in compliance with the rules. If such is not the case new mains should be installed.

"Portables in Garages.—Contractors in figuring the electrical installations in private garages should always include in their estimate the portable lamp required in such garages and specified in the July *Bulletin*. Certificates cannot be issued until this device has been provided.

"Wiring Fixtures.—Fixtures constructed with flat metal arms, and other designs where the arms supporting sockets are solid and the wire cannot be carried through them, must be so constructed that all wires are covered by metal. In the type of fixture described above this will require either a metal tubing in addition to the supporting arm or a metal trough entirely inclosing the wires.

"Insulating Joints.—Owing to the recently reported scarcity of insulating joints, and owing, further, to the reports of a new rule which would allow their omission, substitutes have appeared on the market. These devices are usually constructed of fibre in some form, and the samples brought in by the inspectors often show them to be of a frail and dangerous character. There have been but two or three of these devices approved, and fixture men and contractors are cautioned to be careful that they do not use the unapproved devices. If in doubt call the inspection department.

There has been no change in the rule requiring the use of insulating joints. When such change is made all interested will be duly notified.

"Elevator Inclosures.—In the September *Bulletin* attention was called to the inclosures for the electrical equipment of elevators. For the fireproofing of the floor concrete, tile or sheet metal may be used. Concrete must be at least 3 ins. thick, and when placed over wood floor all openings through such floors must have the exposed ends of boards covered by sheet metal. Sheet metal used as a floor covering must be of not less than No. 14 gauge. Ceilings, if of wood, may be covered by metal lath and plaster or by transite board not less than 0.25 in. thick.

SHORT-CIRCUIT TESTS DETERMINE FUSE PERFORMANCE.

Fuses Must Interrupt Current Greatly in Excess of Their Rated Capacitly When Subjected to Short-Circuit.

If a fuse is to properly perform the function for which it is designed, namely, to serve as a protective device, its design and construction must be such that it will not in itself become a hazard. In other words, it must be capable of opening excessively large currents without exploding or emitting flame or molten metal. This feature of fuse operation receives a great deal of attention from underwriters' laboratories and fuse manufacturers, and elaborate tests are made to determine whether or not the fuse used will withstand short-circuits of such magnitude as might be encountered.

These tests consist of connecting the fuse to the terminals of a storage battery which is capable of delivering a heavy current at the voltage rating of the fuse, the resistance of the circuit being so adjusted that, except for the resistance of the fuse itself and the effect of inductance, the current through the fuse would be as much as 10,000 amperes. The circuit is so arranged that the inductance is reduced to a minimum and kept constant. For this reason a storage battery is specified as the source of energy, and the leads must form a single loop having at least a 1000-sq. ft. air core. Under these conditions the fuse must open the circuit without any injury to the fuse cartridge or the cutout base in which it is mounted, and without emitting flame or molten metal sufficient to ignite absorbent cotton.

The test conditions described practically eliminate the effect of inductance. That these tests are not more severe than might be encountered under actual service conditions has been shown by investigations conducted by the United States Bureau of Standards during which current much in excess of 10,000 amperes, in one case of 107,000 amperes, was noted. The effect of the resistance of the fuse may be such as to reduce the actual current broken to as low as 3100 amperes on 30 ampere fuses.

CONTRACTOR-DEALER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-keeping for the Dealer in Electrical Goods

THIS IS A GOOD SUGGESTION FOR IRONER SALESMEN.

Dealers who handle household ironers find that the more advice and suggestions they offer, the more satisfaction they are sowing among their customers. Satisfaction of one customer results in a constantly growing crop of new customers. One good suggestion which the salesman may offer has to do with the best way to sprinkle linen when it becomes too dry. In sprinkling table linen to be ironed it is best to use a glass sugar shaker and in the water put a little cold starch—about a tablespoonful to a quart of water. This makes the linen iron with about the same stiffness as when new.

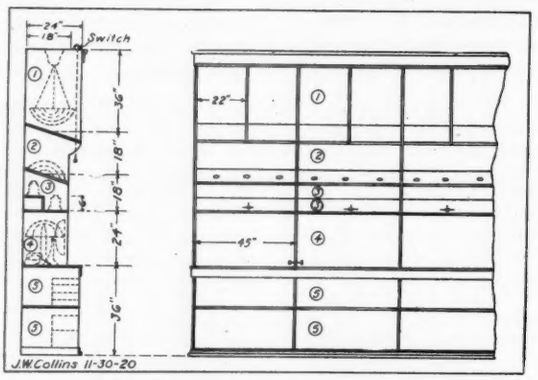
NEW DESIGNS FOR FIXTURE CASE AND WINDOW BACKGROUND.

Refined Type of Wall Case for Lighting Fixtures and Bulkhead Backing for Show Windows, Designed by J. W. Collins, Chicago.

J. W. Collins, secretary of the Electrical Contractors' Association of Chicago, is the designer of a new wall case for the display of lighting fixtures and portable lamps which appears to be a refinement of the original "shadow box" with some additional serviceable features. He has also designed a sectional bulkhead backing for window displays which is quickly and easily adaptable to any size of window space. Both features are finding high favor among contractor-dealers in Chicago and neighboring cities.

The smaller design shows the front elevation of a portion of the wall display case for fixtures, with a view of the end elevation at the left in which the dotted lines represent the fixtures, bowls, portables, etc. The sectional dimensions are given in inches. This case is designed to give individual demonstrations of each fixture in its separate compartment at a natural elevation and present the full value of the lighting effects both day and night. It also serves to keep what Mr. Collins calls the "usual fixture mess" off the ceiling.

After the fixture case is installed the entire inside is painted with flat black and the outside edges blue-gray. Each fixture is switched separately. The bowls are illuminated by extension cords through holes in the inclined bottom of Section 2. One outlet for each compartment should be provided for lighting the drop shades in Section 3.



Front and End Elevations of Wall Case for Displaying Fixtures in Electrical Stores.

Specifications: Paint entire inside flat black, and outside blue-gray. Switch every fixture separately. Illuminate bowls by extension through holes. Illuminate drop shades by one outlet for each compartment. Use (1) and (2) on side of store displaying washers, ironers, etc. Illuminate (4) from duplex plugs in each compartment. Where necessary leave shelf out of (5) for large displays. Show all small portables, heaters, etc., on shelf (4). If store is extra wide, extend (4) and (5) to depth of 30 ins. Cover shelf (4) with cloth or linoleum. Use two-intensity fixtures in store ceiling, dimming when showing sample fixtures in case. Use (5) for neat package goods. Don't crowd any part of display.

It is advised by the designer, and has been found to work out well in actual practice, that the two upper sections of the wall case in which are shown suspended fixtures and bowls respectively, may be installed advantageously on the side of

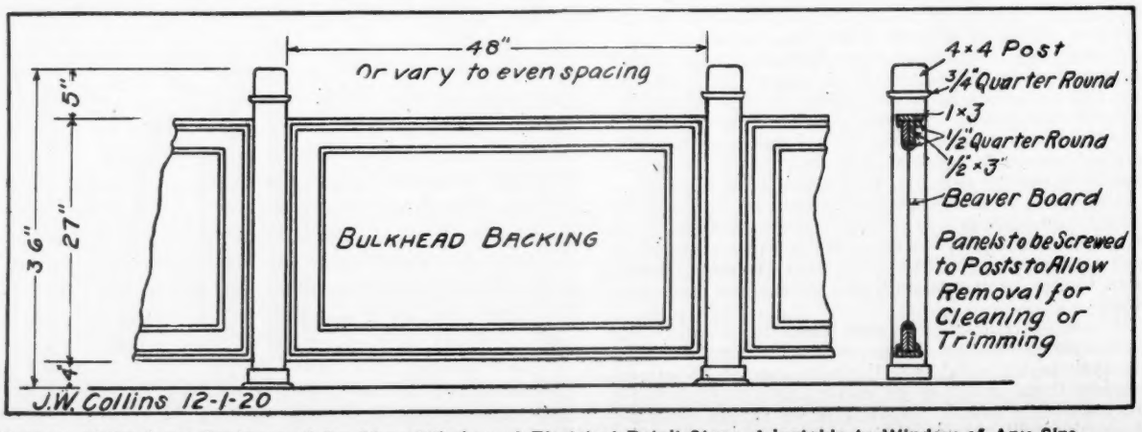


Diagram of Sectional Background for Show Window of Electrical Retail Store, Adaptable to Window of Any Size.

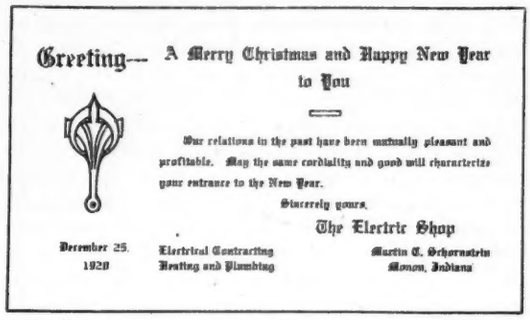
the store above displays of washers, ironers, etc. It is also advised that where the store is extra wide Sections 4 and 5 may be extended to a depth of 30 ins., thus permitting the top of Section 4 to project as a counter for a temporary resting place for goods in process of sales or installation in the upper portions of the case. Two-intensity fixtures should be used for illuminating the store so they could be dimmed when showing fixtures.

In the design of the bulkhead backing shown below the panels are composed of beaverboard upon which showcards and posters may be posted with thumb tacks. It is advised by the designer that the top of the background should never be more than 60 ins. high as measured from the level of the sidewalk. The window should never be trimmed so as to obstruct a view through the interior of the store. "A bulkhead without a backing is like a picture without a frame," says Mr. Collins.

HOLIDAY CARDS REMIND PATRONS OF ELECTRIC SHOP.

Electrical Contractor Sends Customers Engraved Christmas and New Year Greetings Appreciative of Their Patronage.

Martin C. Schornstein, electrical contractor, Monon, Ind., believes in keeping his name and business constantly in the minds of his patrons. He always keeps a list of the names and addresses of every patron who visits his store and he finds it an inexpensive way of advertising to send them frequent reminders by mail. Sometimes it is a descriptive pamphlet furnished by the manufacturer or jobber, and stamped with his name


Greeting— A Merry Christmas and Happy New Year to You
Our relations in the past have been mutually pleasant and profitable. May the same cordiality and good will characterize your entrance to the New Year.
Sincerely yours,
The Electric Shop
December 25, 1920
Electrical Contracting Heating and Plumbing
Martin C. Schornstein Monon, Indiana

This Holiday Greeting Was Sent to Patrons of Monon (Ind.) Electric Shop.

and business address. Frequently Mr. Schornstein sends out personal letters telling of some special electrical appliance or lighting fixture in which they might be interested, and which the dealer promises to give a special demonstration.

A few days prior to last Christmas Mr. Schornstein mailed to all his old and prospective customers a neatly engraved and embossed card of holiday greeting. The card carried the following message: "Our relations in the past have been mutually pleasant and profitable. May the same cordiality and good will characterize your entrance to the New Year."

Canadian Electrical Dealers Show Initiative in Display of Washers and Vacuum Cleaners

Showcards, Cutout Stands and Decorative Trims Used Effectively In Window Displays, Reinforced by Frequent Newspaper Advertisements

By ERNEST A. DENCH

Electric power is cheap in Canada, due to the development of numerous natural resources. Full advantage is apparently taken of this abundant energy by housewives, judging by the extensive clothes lines viewed from the Canadian Pacific train while traveling between Montreal and Vancouver.

Wash-day in many homes is a nightmare to husbands, who are usually served meals of the make-shift variety. Moodie & Jory, Barrie, Ont., played up this argument with great effect. They did this by wheeling an electric washing machine to the entrance of their store. The machine was kept in constant operation while convincing showcards were employed. The best example of these was illustrated by a picture of the interior of a room in which a family was shown at dinner.

The picture cost nothing to produce as it had been clipped from a popular magazine. The caption on the card announced: "Lots of time for work-day meals when you have this time-saver."

The Hydro Shop, Windsor, Ont., had a window display that reminded the housewife of wash-day. Clothes lines were strung across the top of the window by the glass. Hung on the lines at intervals were hand towels, a letter being painted on each towel in order to spell out the particular make of washer. The towels were attacher to the clothes lines by wooden clothes pins. The name of the washer was also spelled on the floor of the window with the aid of wooden clothes pins. An electric washer was stationed in the rear at the right. At the opposite side was a cardboard cutout of a tired looking woman bending over a washtub.

E. A. Drury, Toronto, Ont., placed a sign on the floor of his window containing the names and addresses of local users of electric washers sold by his store.

Moffats, Ltd., Weston, Ont., attracted attention to its electric washer exhibit by placing a kewpie doll in bathing suit on top of each machine. The vision took housewives off their guard, for they would remark, "How cute!" Then their gaze would be attracted to the washer itself, and perhaps to several of the accompanying cards before passing on. In this way some of the arguments proved effective sales producers.

AN ELABORATE SETTING FOR WASHER DISPLAY.

Ashdowns, Winnipeg, Man., is strongly in favor of elaborate settings for household appliances, such as electric washers. One of the recent win-

dows in this store was inclosed at the back with green beaverboard, in the center of which was an oval scenic panel. The picture depicted late autumn in the mountains and there was a lake in the foreground. On each side of the scenic panel was a long, green and gold pillar with a cut-glass vase on top filled with seasonable foliage. At each side in the rear was a slate-colored, square post streaked with gold. Extending from the ceiling was a semi-circular piece of latticework, hanging down from which were purple flowers. Down in front were stands and footstools painted green and gold, each with a vase of seasonable flowers on top. The goods displayed here were electric flatirons. On the green and gold floor in front at each side was an electric washer.

Window Wash-Line in Washer Display.

The Toronto Hydro Electric System, Toronto, Ont., floored its show windows with checked linoleum, giving the impression of a kitchen. The window contained two types of electric washers with cards in front advancing convincing arguments, such as those that follow:

Turn Monday Into Fun Day. Buy a Hydro Washer.
Perfect Washing without labor.
Costs only five cents to operate.

Which Way Do You Want.

Old Way.	New Way.
Wet Feet. Aching Back.	Snowy Clothes. No Labor.
Rubbed-out Clothes.	Power Wringing. Sunny
Tired Nerves. Blue Mondays.	Smiles. Happy Home.

Buy a Hydro Washer.
Fifty-two Days' Hard Labor. Every woman's yearly sentence, who does without a washing machine. Buy a Hydro Washer.

The Wheaton Electrical Co., Saskatoon, Sask., leaned a card against an electric washer in the window. The card briefly pointed out that "No woman should do labor that a machine should do."

Some Canadian Vacuum Cleaner Displays.

For a display of vacuum cleaners one Montreal dealer spread a large rug over the floor of one of his show windows. In the middle of the rug was a vacuum cleaner with showcards resting on a rack at each side. In the middle of the other window was a walnut dining table laid with lace doilies, with a percolator set on a silver tray. Near the table at each side was a walnut chair, as though the family were about to commence a meal. At one side in the rear was an orange-shaded stand lamp.

Another dealer in Winnipeg attracted attention by means of a cardboard cutout of a housewife. Linked up with her arms was a real vacuum cleaner resting upon a brown and rose rug. At the rear in the center was a wicker drawing-room table, placed on which were some of the vacuum cleaner parts. At the far right was a wicker easy chair containing a copy of a popular magazine. The magazine was open at the page where the advertisement of a vacuum cleaner was displayed. At the front center was a large vacuum cleaner. The window was illuminated by a blue-shaded stand lamp of mahogany.

The Hudson's Bay Co., Vancouver, B. C., hung a large carpet from the back of the window to the front. Placed on a low stand at the front and to the right was a wire carpet beater, accompanied by the following card: "It Beats." At the front center was a corn broom, with a card reading, "As it sweeps."

At the front on the left side was a wax figure to represent a housewife, who wielded a vacuum cleaner, the card reading, "as it cleans."

Creating Action in Cleaner Display.

The Electric Supply & Contracting Co., Vancouver, B. C., laid a rug diagonally across its window. At one of the front corners of the rug was a pile of dust, lying on which was the mouth of a vacuum cleaner. This exhibit served to show where the rug had been cleaned. On the rug near the center, fixed in a stand, were four tiny silk flags. Another cleaner was placed on the inner end of the rug in a standing position with the nozzle attachment pointing at the flags. The current attached to the cleaner was turned on, causing a strong current of air to make the flags wave in the breeze. Also, coming within range of the current of air was a narrow ribbon fastened to the nozzle of the cleaner. At each side of the window were additional cleaners.

In Vancouver an advertisement in the newspapers that attracted much attention was that of the B. C. Electric Co. The announcement referred to vacuum cleaners, as follows:

FOR HOUSEWIVES WHO CARE—ELECTRIC CLEANING.

Housewives who care—
for their own health,
for their own appearance,
for a neat, tidy home,
for thorough cleanliness,
for saving their rugs—
use the Electric Cleaner.
You, too, can easily own a modern, labor-saving Electric Cleaner.

The above are but a few of the many instances where the contractor-dealers of Canada are showing merchandising initiative and progressive activities fully equal to those displayed in the United States.

PRICE TAGS DISPLAYED ON GOODS IN SHOW WINDOW.

"When I see an article in a show window that looks desirable," said a friend to an electrical contractor-dealer recently, "I look for the card bearing the price. If the article is not priced, no matter how much I would like to know, with the possibility of buying if it was within my means, I walk on. I never go in to find out the price because I hate to appear cheap in the eyes of the clerk by walking out when I find the price is too high for me."

The matter of placing price tags on articles in window displays was discussed at a recent meeting of electrical contractor-dealers in Milwaukee. It was generally agreed that when the price of the article was approximately $10 or less it was a good idea to place the price tag on it. Above that amount the dealers felt that the display of the price without an opportunity to give a selling argument might drive the prospective customer away. Attention was also called to a number of electrical dealers who have been very successful in displaying prices on all appliances.

QUESTIONS AND ANSWERS

All Readers Are Invited to Submit Contributions on Electrical Matters to This Department—Answers Should Be Sent Within Eight Days of Date of Publication of Question—Payment Will Be Made for All Answers Published

Questions.

No. 510.—ADVISABILITY OF HOLDING SALES OF ELECTRICAL GOODS.—I have been endeavoring to learn from various sources, including jobbers, dealers, etc., the advantages to be gained by and the difficulties met with in conducting a sale or sales of electrical goods. Other merchants have sales for the purpose of raising money, reducing stock and cultivating new customers, and I want to find out if the electrical dealer can benefit by following their example. Will dealers or others in touch with the situation give their views on the subject?—W. R. B., Phoenix, Ariz.

No. 515.—PRECAUTIONS TAKEN IN GROUNDING LINES AND BUSES.—What precautions are taken to guard against errors in making ground connections in power houses to high-tension cables and buses? Mistakes that have been costly in both life and property have been made, and it is believed that a free discussion of present common practice will be of much benefit. What bus- and line-clip arrangements are used? What locks and hold cards are used? Is it common practice to check connections twice or to have two different men check the connections? Are definite steps taken to see that the ground is maintained even though a mistake has been made?—A. L. T., New York City.

No. 516.—WINDING FOR THREE-PHASE MOTOR.—I have a four-pole, 220-volt, three-phase induction motor rated at 0.5 hp. and rewound with 24 coils in 24 slots. The coils are arranged and connected as a lap winding. The motor which was made by the General Electric Co., Schenectady, N. Y., has a squirrel-cage rotor. The coils are connected in one Y circuit, there being two coils per group with 109 turns of No. 20 double-cotton-covered wire per group. The winding pitch is from 1 to 6.

Will someone draw a diagram illustrating the direction of current flow in the windings described above? Considerable trouble is being experienced with heating. It is believed that some of the coils are bucking each other. The full-pitch winding of this motor would be from 1 to 7.—R. J. B., Racine, Wis.

No. 517.—REFINISHING BRASS TUBING.—Can someone give a good and practical method of refinishing brass tubing and fixture parts? The tubing which I have under consideration at the present time is corrugated.—A. S. N., Plymouth, Mass.

No. 518.—USE OF CURRENT TRANSFORMERS.—Will someone please explain why current tranformers are used in connection with a-c. ammeters instead of shunts? I presume that it is due to an ununiform reactance in the instruments with different current values. Am I correct, and are there any other reasons such as skin effect in the shunt or safety? Are shunts ever used, or were they ever used with a-c. ammeters?—J. B., New York City.

No. 519.—PROTECTING TRANSFORMER POLES NEAR SCHOOL BUILDINGS.—In the safety-first meetings of the company where I am employed the matter of protecting transformer banks near school buildings has been brought up. The proposition is to determine what protection is required to prevent accidents that might result from children climbing the poles. What precautions are taken by other companies to guard against such accidents?—C. W. B., Enid, Okla.

No. 520.—DESIGN OF WINDINGS FOR INDUCTION MOTORS.—Will someone give formulas and examples for determining the proper size of wire and number of turns to be used in winding one, two and three-phase induction motors to operate on 25, 50 and 60-cycle lines at from 110 to 500 volts?—S. M. C., Quebec, Canada.

Answers.

No. 509.—CONNECTING SINGLE TRANSFORMERS IN A THREE-PHASE BANK.—I have three single-phase, 5-kv-a. Westinghouse transformers, rated at 2200 to 220 and 110 volts, and want to know if I can use them connected together on a three-phase circuit and get 220 and 110 volts on the secondary side. If so, will someone please explain how to connect them and make a simple diagram for a guide?—R. L. G., Reynolda, N. C.

Answer.—In connection with this question and the answer as given by A. G. T., East Orange, N. J., it seems to me that the answer given is not the information desired in the question, and I desire to submit the following plan for getting

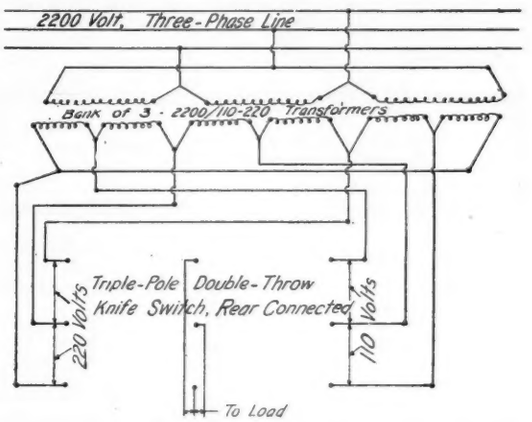


Diagram of 110/220-Volt Connections Through Double-Throw Switch.

either 110 or 220-volt, three-phase energy from a bank of three single-phase transformers:

This can be done by means of a rear-connected, triple-pole, double-throw knife switch wired with the load connected to the blade contacts, one set of end connections being attached to the 220-volt lines and the other set of end connections to the 110-volt lines as shown in the accompanying diagram.—H. H. D., Rupert, Ida.

No. 514.—ILLUMINATION OF A MACHINE SHOP.—What is the best method to employ and what intensity in foot-candles should be used in lighting a fairly large machine shop? The shop in question is 50 by 200 ft. in size and has a saw-tooth roof with windows all along both sides and the ends. Drill presses, planers, shapers, saws, milling machines and other tools all have individual motors so that there are no belts to interfere with overhead installation. Should a system of general illuminating be installed, or would a mixed system of general and local lighting be better or cheaper? What special provision should be made for the work benches along the sides of the shop? If general illumination is best, what intensity should be used and what size lamps would give the best results?—N. S. T., Detroit.

Answer.—This machine shop can be lighted quite uniformly and with very little shadow effect by a system of general illumination, using 150-watt bowl-enameled Mazda C lamps equipped with RLM standard steel reflectors and mounted about 10 ft. above the floor. There should be five rows of 20 lamps each, making the spacing between units 10 ft. Such an installation will provide an illumination intensity of about 10 foot-candles initially and about 8 foot-candles

maintained intensity, which is sufficient for medium machine and bench work. For fine machine and bench work 200-watt lamps should be installed on the same spacing. Assuming that the benches are 3 ft. wide, the outer rows of units should be about 4 ft. from the wall. This will adequately light the benches and will prevent the operator from working in his own shadow. The only local lighting necessary with such a system will be in cases of deep boring and the like.

If only rough machine and bench work is performed in this shop four rows of 16 units each could be installed using 200-watt lamps in RLM standard steel reflectors mounted about 12 ft. above the floor. These units would be spaced 12 ft. apart. This installation would provide about 9 foot-candles initially and about 6.5 foot-candles maintained intensity, which is sufficient for rough machine and bench work. By putting the outer rows of units about 4 ft, from the walls any rough bench work would be adequately lighted.—G. W. B., Cleveland, O.

BOOK REVIEWS

"Laboratory Projects in Physics." By Frederick F. Good. New York: The Macmillan Co. Cloth, 255 pp. (7.25 ins. by 5 ins.) with 104 illustrations. Supplied by Electrical Review Publishing Co., Inc.

The experiments presented in this book have been arranged to give concrete expression in the field of physics to recent tendencies in the teaching of science. It is the intention of the author that the experiments should form part of a physics course including class-room work and demonstrations. The various procedures have been worked out with the idea of relieving the teacher of as much work as possible.

The various experiments are arranged to have a practical application in everyday life, and numerous specific devices in common use are made the subject of detailed study. For example, detailed studies are made of carburetors, automobile engines, furnaces, scales, water motors, sewing machines, pumps, city gas, etc., in addition to the regular studies of the abstract theory applicapable to these devices.

"Industrial Electric Vehicles and Trucks." By W. Worby Beaumont. Philadelphia: J. B. Lippincott Co. Cloth, 178 pp. (9 ins. by 6 ins.) with 188 illustrations. Supplied by Electrical Review Publishing Co., Inc., for $4.50.

This book is intended to serve as an introduction of the industrial electric vehicle and to afford to those readers who become in any way concerned with the transport of materials such general information upon the vehicles as now designed, made, and used, and as particularly adapted to a large number of industries, which will enable them to form their own conclusions. It is also intended to give some detailed information concerning the most important requirements of an electric-vehicle-using establishment, especially in relation to the provisions for and the use and care of the batteries upon which the success of the electric vehicle depends. It is not intended as a textbook for the use of schools of any sort, or for beginners on any of the branches of theory of design of the mechanism and of the chassis of the vehicles described. Nor is it intended to prescribe the materials or their physical properties for makers of vehicles or of their components. It is intended, however, to make better known the fact that the industrial electric vehicle has taken an important position in industrial enterprise, to let the commercial transport world gather some useful information as to what this vehicle is, what are its limitations, and on what work it can be profitably used.

The first 40 pages are devoted to lorries and vans, showing illustrations of specific vehicles, details of construction, control mechanisms and circuits, steering gear, axle construction, driving gear, etc. The next 44 pages deal with industrial trucks, showing somewhat the same character of detail as that presented relative to lorries and vans. Vehicle motors, power requirements, batteries, controllers, charging and charging equipment, and costs are taken up in later chapters.

"Storage Batteries.' By C. J. Hawkes. Minneapolis: Wm. Hood Dunwoody Industrial Institute. Cloth, 157 pp. (9 ins. by 6 ins.) with many illustrations. Supplied by Electrical Review Publishing Co., Inc., for $2.

A series of lessons prepared in mimeograph form and used by students of the Dunwoody Institute served as the basis of this volume. The book has been prepared including the various revisions and additions found essential in the repeated use of the original lessons.

The first three lessons take up a general outline of the book, the history and development of the storage battery, and its chemical action. Characteristics of lead and nickle-iron cells are taken up in the next two lessons, or chapters, the manufacture of cells and parts being taken up next. Battery troubles, battery design and repair and other important features are covered in other lessons. This book should be particularly valuable to the man responsible for the repair, maintenance or operation of batteries, or for the man desiring practical information about batteries for any reason.

"Storage Battery Manual." By Lucius C. Dunn. Annapolis: United States Naval Institute. Cloth, 391 pp. (9 ins. by 6 ins.) with 146 illustrations. Supplied by Electrical Review Publishing Co., Inc., for $7.

This book has been prepared to fill the needs for an up-to-date text with particular application to storage battery engineering in the naval service. However, because of the full and thorough manner in which the subject matter is treated, the book is applicable to the study of battery work in any field.

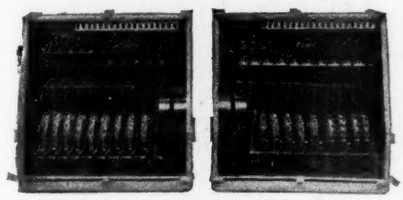
The first 24 pages are devoted to preliminary considerations, definitions and nomenclature. The next 50 pages are devoted to further details including application to naval service, and types of assemblies. Capacity and efficiency, the electrolyte, plate insulation, jars, hard-rubber parts, terminals and connectors, trays, charging and discharging, etc., are taken up in later chapters. Detailed information is presented in regard to repairs, packing, putting batteries in service, taking them out of service, inspection and testing.

NEW APPLIANCES

Newly Developed and Improved Electrical and Mechanical Apparatus, Appliances, and Devices Now Being Placed on the Market

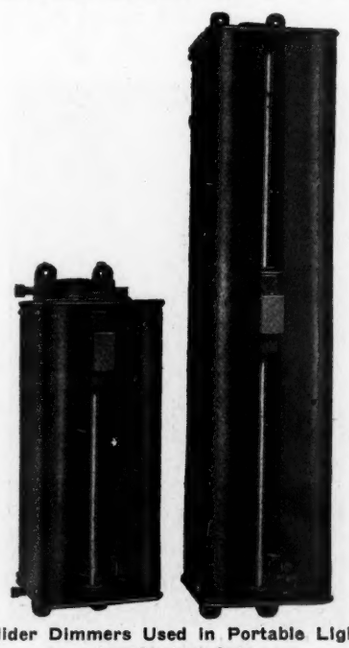
Portable Dimmer Cases Used by Traveling Shows.

For the use of traveling shows, including vaudeville, legitimate, variety and moving pictures, to enable the company to produce the proper lighting effects in the house in which they play



Dimmer Case Used by Traveling Theatrical Company.

without having to depend upon the special electrical equipment in each theater small, compact, portable dimmer cases containing all the necessary devices for proper regulation of the various theater lights are being made by the Display State Lighting Co., Inc., 314 W. 44th street, New York City. These cases are easily carried with other baggage and may be promptly set up wherever the company is playing. Where the case is desired to be extremely light so as not to exceed the 250-lb. maximum limit usually placed on single pieces of baggage Cutler-Hammer 1000-watt slider dimmers are used as these



Slider Dimmers Used in Portable Lighting-Control Sets.

are small and compact. These dimmers are made in 1000 and 300-watt sizes. Where the control circuits require a dimmer of greater capacity than 1000 watts the standard round-plate dimmers are used.

Each case is made special for the producing company ordering it and is fully equipped with dimmers, fuses and switches in order to fulfill all the lighting requirements of the particular company. A typical dimmer box is shown in the accompanying illustration, this box being built in two sections for the Joe Weber Honeydew Co. This switchboard dimmer box handles the entire equipment of lights for this company, and the house switchboard is used only to take care of the auditorium lights.

The Honeydew electrical equipment consists of a first borderlight of 30 baby spots, footlights of 20 baby spots, a second borderlight of eight hanging bunchlights, a third borderlight of ten hanging bunchlights and a fourth borderlight of ten hanging floodlights and 6 hanging spotlights. In addition to these there are eight floodlights on stands, six spotlights, a number of striplights, chandelier brackets, etc., all used on the stage. The lights are of 1000-watt capacity except the baby spots which are rated at 300 watts.

The 300-watt slider dimmers shown mounted above the round-plate dimmers in the illustration handle eight spots in the first borderlight and eight in the footlights. All of the other lights are controlled through the round-plate-type dimmers. One of the round-plate dimmer banks consists of nine plates and ten dimmers and the other consists of nine plates and seven dimmers. Each dimmer may be operated independently by an individual lever, or the levers may be interlocked and all of the dimmers in the bank operated simultaneously with the master lever, one of which is provided with each bank.

These dimmer cases are made with a hinged cover which may be locked, and are lined with 20-gauge metal. The switches and fuses are completely inclosed. The lighting for this company is very complicated, but is handled effectively through this dimmer box which enables the electrician to produce the same lighting atmosphere during each performance independent of the electrical equipment in the theater in which the company happens to be playing.

Flexible Fitting for Fixture Suspension.

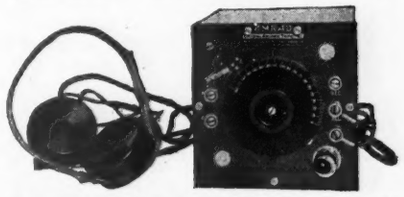
The type UNJ condulet fixture joint being placed on the market by the Crouse-Hinds Co., Syracuse, N. Y., is intended for the supporting of suspended fixtures, and can be used in conjunction with condulets, in which case the UNJ fitting supports the fixture and the condulet provides a separate wiring chamber for the connections. The type UNJ fitting being a universal joint assures that the fixture, even though mounted on an inclined surface, will hang plumb. When there are several fixtures in a row this is important, otherwise the appearance of the installation will be impaired. The flexibility of the type UNJ fitting also prevents breaking of the fixture at the point of suspension due to strains set up by the wind or by hitting the fixture with a step ladder, or the like. In cleaning reflector or removing lamps the operator is

Type UNJ Fixture Joint.

apt to grasp the fixture, and if it is absolutely rigid it may bend at the point of mounting. The construction of this fitting is such that the wires pass through it, consequently no wires are exposed at the fixture joint. The type UNJ fixture joint will allow the fixture to swing through an angle of 20 deg. in any direction from the perpendicular.

Compact Wireless Receiving Set.

The production of a complete and practical wireless receiving set is announced by the American Radio & Research Corp., 21 Park Row, New York City. This new "Amrad" product consists of a specially designed variometer and crystal detector



Wireless Receiving Set Intended to Work at Ranges up to 500 Miles.

mounted on a formica panel and incased in a finished chestnut cabinet. The overall dimensions are 5 by 5 by 7 ins. There are three wave-length adjustments giving a range of 170 to 750 meters, and the outfit is rated at 100 to 500 mi. with a 60-ft. aerial. It is marketed at a popular price and includes a telephone head set and complete antenna and ground equipment. While complete in itself the set fits in with the new highly specialized "Amrad" receiving units so that it is not necessary for the purchaser to discard his original equipment as he makes changes or extensions to his system.

LATEST APPROVED APPLIANCES

Approved by Underwriters' Laboratories, Following Examination and Tests Conducted Under the Standards of the National Electrical Code

Fuses, Cartridge-Inclosed, Renewable Type.—Monarch Refillable Fuse Co., Jamestown, N. Y. Listed Dec. 3, 1920.

"Monarch" cartridge-inclosed fuses of renewable type; 0-600 amperes, 250 volts and 0-600 amperes, 600 volts.

"Monarch" Renewable Fuses.

This type of fuse, when fully inspected, is authorized to bear labels consisting of a combination of the present form of label used by manufacturers, the word "Renewable," and "Und. Lab. Inspected."

Ground Clamps.—Utility Fittings Co., 812 Walnut street, Philadelphia. Listed Nov. 19, 1920.

"Utility" ground clamps for use with 3-in. rigid conduit or less.

Heaters, Cooking Appliances. — Macy Electric Co., 409 East Bay street, Jacksonville, Fla. Listed Nov. 30, 1920.

Doughnut and potato fryer consisting of metal tank and circular forms with one and two heater elements mounted in bottom of tank to be covered with oil or melted fat when in use; catalog No. 1-A; double element, 40, 50 and 60 amperes, 110 volts.

Motion Picture Appliances.—Hull, Salmon Manufacturing Co., 1828 Wilkens avenue, Baltimore, Md. Listed Nov. 30, 1920.

Insulated storage receptacle for cabinet for motion picture films, consisting of a number of circular individual compartments, side by side, each of proper size to contain one reel of film. Compartments separated from each other by heat-insulating material and lined with similar material at edges. Each compartment provided with self-closing cover. Made with various numbers of compartments for 1000 and 2000-ft. reels. Designed for use in motion-picture machine booths.

Outlet Plates.—Conduit Fittings Co., 411 South Clinton street, Chicago. Listed Oct. 29, 1920.

"O." steel outlet plate with means for bonding to gas pipe.

Outlet Plates.—United Electrical Manufacturing Co., Adrian, Mich. Listed Nov. 2, 1920.

"Trojan" steel outlet plates; catalog No. 800R.

Receptacles, Medium Base.—H. T. Paiste, 32nd and Arch streets, Philadelphia. Listed Nov. 5, 1920.

"Paiste" metal shell medium-base receptacles; key, catalog Nos. 9184, H-50, N-50, NA-50, O-50, P-50, Q-50, R-50, RA-50, S-50, SM-50, SN-50 and W-50; keyless, catalog Nos. 9185, H-51, N-51, NA-51, O-51, P-51, Q-51, R-51, RA-51, S-51, SM-51, SN-51 and W-51; pull, catalog Nos. H-52, N-52, NA-52, O-52, P-52, Q-52, R-52, RA-52, S-52, SM-52, SN-52 and W-52; also above types with shadeholders attached. Cleat rosette receptacles for link fuses, for use only in large mills in accordance with Rule 23-*d*, National Electrical Code; 2 amperes, 125 volts; catalog Nos. TU-50, TU-51, TU-52; also these styles with shadeholders attached.

Resistance Appliances. — Cutler-Hammer Manufacturing Co., Milwaukee. Listed Nov. 2, 1920.

"C-H." controllers, drawing No. 17430; self-starters, bulletin No. 7021.

Receptacles, Medium-Base.—Union Electric Co., Trenton, N. J. Listed Dec. 3, 1920.

"Union" brass-shell medium-base receptacles; key, catalog Nos. 5070 and 5080; keyless, catalog Nos. 5570 and 5580.

Signal Appliances. — Measuregraph Co., 1819 Olive street, St. Louis. Listed Dec, 3, 1920.

Device for signaling expiration of predetermined period of time by ringing bell and lighting lamp; "Time Measuregraph"; 60 watts, 125 or 250 volts.

Signaling Systems. — International Time Recording Co., Endicott, N. Y. Listed Nov. 19, 1920.

Electric synchronized time system, consisting of self-winder, master clock, master relay and one or more self-winding, secondary clock movements; 125-250 volts. Electric impulse time system, consisting of self-winding master clock and master relay, and one or more secondary clocks, distribution cabinets, program devices, automatic charging devices or similar equipment.

Signs.—McSavaney Co., Springfield, O. Listed Oct. 22, 1920.

Electrically illuminated display signs for general use.

Sockets, Medium Base.—Cutler-Hammer Manufacturing Co., Milwaukee. Listed Oct. 13, 1920.

"C-H." candle sockets; push, 660 watts, 250 volts; catalog No. 7564.

Sockets, Medium Base.—Harvey Hubbell, Inc., Bridgeport, Conn. Listed Oct. 29, 1920.

"Hubbell" metal shell medium-base sockets; pull, 660 watts, 250 volts; catalog No. 3418.

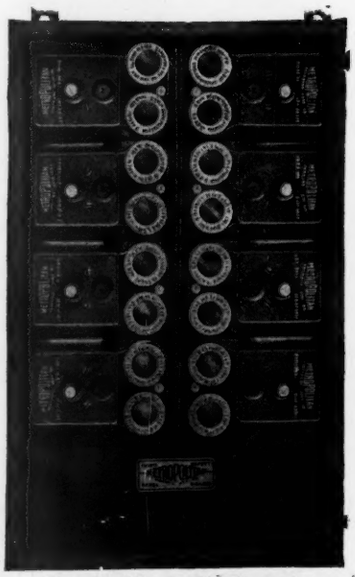
Sockets, Medium-Base. — Union Electric Co., Trenton, N. J. Listed Dec. 3, 1920.

"Union" metal-shell medium-base sockets; key, catalog Nos. 5030, 5040 and 5050; keyless, catalog Nos. 5530, 5540 and 5550.

Panelboards.—Sam Garvin & Co., 5124 West Lake street, Chicago. Listed Nov. 30, 1920.

Panelboard consisting of an assembly of busbars with or without standard cutout parts, or with or without standard switches mounted on insulating bases. Designed for use on low-potential circuits.

Panelboards. — Metropolitan Electric Manufacturing Co., Boulevard and 14th street, Long Island City, N. Y. Listed Nov. 30, 1920.



"Metropolitan" Panelboard.

Panelboard consisting of an assembly or busbars with or without standard cutout parts, or with or without standard switches mounted on insulating bases. Designed for use on low-potential circuit.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

American Enameled Magnet Wire Co., Muskegon, Mich., has increased its capital stock from $250,000 to $600,000.

Ohio Motor Co., Sandusky, O., has disposed of its plant to the Power Equipment Producing Co., recently incorporated.

Pittsburgh Transformer Co., Pittsburgh, has issued a folder descriptive of its pressed-steel case distributing transformers.

Inland Wire & Cable Co., Cleveland, plans to erect a one-story plant at Hammond, Ind., at an estimated cost of $100,000.

Globe Electric Works, San Francisco and San Diego, Cal., have purchased the Kern Valley Electric Co., Bakersfield, Cal.

American Steel & Wire Co., Worcester, Mass., plans to erect a three-story addition to its south works plant at a cost of about $150,000.

Harvey Hubbell, Inc., Bridgeport, Conn., has issued bulletin No. 16-22 descriptive of its toggle flush switches equipped with adjustable aligning lugs.

Independent Wireless Telegraph Co., 42 Broadway, New York City, manufacturer of wireless apparatus, has increased its capital stock to $500,000.

Westinghouse Traction Brake Co., Wilmerding, Pa., manufacturer of air brakes, air compressors, etc., has increased its capital from $1,000,000 to $2,000,000.

H. S. B. Cochrane Corp., Lippincott and 17th streets, Philadelphia, manufacturer of power plant specialties, has filed plans for alterations at its power house.

Renim Specialty Co., 110 K street, Boston, has distributed catalog No. B-1, covering its outlet boxes for use with flexible armored conductors and nonmetallic loom.

William J. Buckley, Bridgeport, Conn., has been appointed temporary receiver of the Star Electric Co., in bond of $10,000, with authority to continue the business.

Reliance Electric & Engineering Co., Cleveland, manufacturer of electric motors and generators, has moved its Boston office to room 566, 200 Devonshire street.

Acheson Graphite Co., Niagara Falls, N. Y., has issued a memorandum book containing various technical and other electrical data arranged for ready reference.

Baltimore Electrical Supply Co., 307 North Calvert street, Baltimore, has issued its general catalog No. 7 covering standard electrical supplies. The book consists of 1100 pages devoted to electrical material and contains a number of reference tables and wiring data, including underwriters' rules on inside wiring and other information.

Electric Storage Battery Co., Allegheny and 19th streets, Philadelphia, has filed plans for the erection of a two-story building to be used for employes' welfare work.

Diehl Manufacturing Co., Elizabeth, N. J., manufacturer of fans, motors, etc., has announced a wage reduction of 20% at its local plant. About 1500 employes are affected.

Leco Electric Lamp Co., New York City, manufacturer of electric lighting equipment, has taken a lease for a term of years on property now occupied at 133 Mercer street.

Mica Insulator Co., 68 Church street, New York City, has issued catalog No. 85 covering its line of electrical insulating materials for commutators, armatures and other purposes.

Industrial Controller Co., 886 Greenbush street, Milwaukee, has issued its "I-C" handbook No. 6 on controlling devices. It is arranged in loose-leaf form so that future sheets can easily be inserted.

Holabird Electrical Co., San Francisco, has sold its electrical jobbing business to the Fobes Supply Co. and will continue to handle the interests of the Ohio Brass Co. in California and Nevada, with office at 501 Hobart building, San Francisco.

Great Western Contracting Co., Kansas City, Mo., representative for the Conveyors Corp. of America, Chicago, has changed its name to the Rawlings Industrial Equipment Co. This organization acts as sales engineer for power plant machinery manufacturers and in addition to handling coal and ash conveyors for the Conveyors Corp. also represents the Springfield Boiler Co. and the Cooling Tower Co.

International General Electric Co., Inc., has announced that its headquarters force, which has been located in the main office building of the General Electric Co., has moved into its new office building erected on what was formerly the Westinghouse property on River road, Schenectady, N. Y. This change places under one roof about 400 people in the following departments: Executive, European, the Americas, Far East, merchandising, service and accounting. The total floor space of the new six-story structure is approximately 70,000 sq. ft., each floor being about 60 by 220 ft. A subdivision of this space into attractive offices has been made in such a way that maximum convenience, with perfect light and ventilation, has been secured. The International General Electric Co., Inc., was formed in 1919 to take over and expand the foreign business of the General Electric Co. The officers of the International company are: Chairman of the board, Charles Neave; president, Gerard Swope; vice-president, M. A. Oudin, and secretary-treasurer, P. M. Haight.

J. F. Buchanan & Co., Philadelphia, electrical supply jobbers, recently celebrated its twenty-fifth anniversary, the occasion being marked by the distribution of bonuses to employes and presentation of gifts to John F. Buchanan and Gilbert S. Smith, who have charge of the company's business.

Edison Electric Appliance Co., Inc., 5660 West Taylor street, Chicago, has issued a booklet entitled, "A Coat Pocket College of Electricity," which contains information relative to a course in electrical appliance salesmanship prepared by a group of experts, to be conducted by the company under the name of the "Edison School of Salesmanship."

Edison Lamp Works of General Electric Co., Fort Wayne, Ind., of which J. W. Anspach is superintendent, has announced that owing to the depression in the electric lamp business and the necessity for cutting out expense on nonproductive business, construction work on the new plant in the eastern part of the city has ceased for the present. This plant was to have been completed in March at an estimated cost of $500,000. The demand for the product of the uptown lamp works has fallen off to such an extent that the employes are working only four days a week and production has been cut almost 30%. Production at the Broadway plant has also been cut, quite a number of men having been laid off temporarily, work in the small motors department being almost entirely suspended.

Ajax Electric Specialty Co., St. Louis, has announced the appointment of sales representatives for various sections of the country as follows: Clarence P. Denny, 524 First avenue, South, Seattle, Wash., Oregon and Washington; A. C. Riddell, Higgins building, Los Angeles, Cal., and Marvin building, San Francisco, California, Nevada, Arizona, New Mexico, including El Paso only in Texas; Kiser, Ackerman, Gardner Co., 240 South Sixth street, Salt Lake City, Idaho, Utah, Montana and Wyoming; Kirtz-Bruhn Co., 506 Liberty building, Buffalo, N. Y., New York state exclusive of New York City, western Pennsylvania and state of Ohio exclusive of Cincinnati; Electrical Sales Co., Kenyon building, Louisville, Ky., Cincinnati and Louisville; F. W. Oettinger Corp., Grand Central Terminal, New York City, Philadelphia, Baltimore, Washington, states of Connecticut, Rhode Island, Massachusetts, Maine and Vermont; O. T. Jenkins, 414 Dallas County State building, Dallas, Tex., Oklahoma, Texas, New Mexico and Shreveport, La.; Walter Ehman, 421 Hall building, Kansas City, Mo., Kansas, western Missouri, Iowa and Nebraska; J. A. Jacobsen, 17 North Wabash avenue, Chicago, Wisconsin, northern Indiana and northern Illinois.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

CHARLES F. SHULTZ has been appointed chief engineer of the Crom-by plant of the Philadelphia Gas & Electric Co., Phoenixville, Pa.

PAUL LEBENBAUM has been appointed assistant electrical engineer for the Southern Pacific Co., San Francisco, to succeed F. E. Geibel, who has resigned.

E. B. NEISWANGER has resigned as chief engineer of the Texas Power & Light Co., Dallas, Tex., to assume the duties of president of the American Fuel Corp.

HARVEY POND has been appointed general sales manager of the Arrow Electric Co., Hartford, Conn., and has been succeeded as advertising manager by Kenneth J. Owens.

J. A. TODD has been appointed general superintendent of the Consolidated Light & Power Co., Kewanee, Ill. He formerly held the position of superintendent of electric distribution.

A. G. PRATT, vice-president and general manager of the Babcock & Wilcox Co., New York City, is at present on an extended tour of the South American countries for the purpose of benefiting his health.

M. C. TURPIN, Westinghouse Merchandising Bureau, is spending a ten-day vacation in Bermuda. He will return in time to participate in the "Better Merchandising Shows" to be held in Detroit, Jan. 31-Feb. 5.

GEORGE C. ROUGH, president and general manager of the Packard Electric Co., St. Catherines, Ont., has disposed of his interests in the company and resigned his position. He plans to continue in the electrical business and locate in Montreal as manufacturetrs' representative.

STEPHEN Q. HAYES, who is connected with the switchboard engineering department of the Westinghouse Electric & Manufacturing Co., is en route to Australia in the interests of the company. He will make his headquarters in the Queensland building, 84 William street, Melbourne. Mr. Hayes expects to be away about six months.

C. M. HARRIS has been elected vice-president and executive in charge of the Hagerstown & Frederick Railway Co. and its subsidiaries, including the Northern Virginia Power Co., Winchester, Va.; Potomac Light & Power Co., Martinsburg, W. Va.; Waynesboro Electric Co., and the Chambersburg, Gettysburg & Waynesboro Street Railway Co., Waynesboro, Pa.

FRANK A. BURR, who for the past year has been engaged in engineering work with the Narragansett Electric Lighting Co. and the Brown & Sharpe Manufacturing Co., both of Providence, R. I., has been appointed to the faculty of the Rhode Island State College to fill the vacancy caused by the absence of Prof. R. L. Wales, who is engaged in research work in the Bureau of Standards, Washington, D. C.

WILLIAM MCNEIL has succeeded R. F. Hayward as general manager of the Western Power Co., Vancouver, B. C., Can. Mr. McNeil was formerly assistant general manager.

F. L. BUTLER has resigned as manager of the Winnipeg Electric Railway Co., to take charge of the railway department of the Georgia Railway & Power Co., Atlanta, Ga.

B. S. MANUEL, manager of the appliance section, supply department, Westinghouse Electric & Manufacturing Co., Mansfield, O., has resigned to become general manager of the Electric Railway & Manufacturers' Supply Co., electrical jobber, San Francisco.

B. S. Manuel.

A. E. HOGREBE, mechanical and electrical engineer, Baltimore, has been appointed sales engineer for the Baltimore territory of the Champion Engineering Co., Kenton, O., manufacturer of electric traveling cranes.

HUGH A. BROWN, formerly connected with the Burke Electric Co., and the Crocker-Wheeler Co., has been appointed sales manager of thet Electro-Dynamic Co., Bayonne, N. J., manufacturer of motors and generators.

GARNET BLOCKSIDGE, railway department, Philadelphia office of the Westinghouse Electric & Manufacturing Co., has resigned to become sales engineer, London office of the Westinghouse International Co. After graduating from the Virginia Polytechnic Institute in 1906, he joined the Westinghouse Electric & Manufacturing Co. as a graduate student and remained at East Pittsburgh until 1912, when he was transferred to the Baltimore office as salesman in the railway and light department. On Jan. 1, 1916, he was transferred to the Philadelphia office of the company where he has been until this time.

WILLIAM M. PHILLIPS, Philadelphia local manager of the Western Union Telegraph Co., tendered an interesting address on the subject of "Telegraph the Modern Way," before the members of the Rotary Club at their weekly luncheon, Jan. 5.

G. S. PRITCHARD, formerly connected with the Western Electric Co. at the Chicago office and Hawthorne factory, has accepted a position on the sales force of the line materials division of W. N. Matthews & Bro., Chicago, manufacturer of electrical goods.

H. B. GEAR, engineer of distribution of the Commonwealth Edison Co., Chicago, has been apopinted to the position of assistant to Vice-president L. A. Ferguson, to succeed H. E. Niesz, recently appointed manager of the industrial relations department of the company.

F. C. REED, formerly manager of the price section of the industrial department, Westinghouse Electric and Manufacturing Co., has been placed in charge of the Bluefield and Charleston (W. Va.) offices of that Company, with headquarters in the Charleston offices.

G. C. HECKMAN, formerly in charge of the installation of electrical equipment in new generating stations and substations for the Southern California Edison Co., Los Angeles, Cal., has been promoted to the position of superintendent of electrical construction.

F. B. SAWYER, for the past three years vice-president of the Lehigh Valley Transit Co., Allentown, Pa., has been elected president, succeeding Harrison R. Fehr, resigned. E. M. Young has been elected vice-president; H. H. Patterson, vice-president and general manager; C. N. Wagner, secretary and treasurer; and W. L. Davis, auditor.

COLIN G. FINK, manager of laboratories of the Chile Exploration Co., New York City, gave an address on "Modern Developments in Metallurgical Research," before the Pittsburgh Section of the American Electrochemical Society at the Mellon Institute, Pittsburgh, Jan. 28.

OBITUARY.

JOHN D. STREET, who had been connected with Stone & Webster, Inc., Boston, for the past ten years as a mechanical engineer, died Jan. 2 at the age of 67 years.

MELVILLE P. HAYWARD died at his home in Springfield, Mass., Jan. 4, aged 46 years. For the past four years he had been assistant purchasing agent for the American Bosch Magneto Co.

L. D. THOMPSON, who had been connected with the Galveston (Tex.) Electric Co., since 1897, died recently. At the time of his death he was commercial agent of the company, which position he had occupied for the past eight years.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Bar Harbor, Me.—The Bureau of Yards & Docks, Navy department, Washington, D. C., is completing plans for the construction of a radio building at the Otter Cliffs, Bar Harbor. A similar station will also be constructed in the vicinity of Prince Neck, R. I.

Middlebury, Vt.—Fire, Jan. 15, destroyed the power plant of the Hortonia Power Co., furnishing service to Mineville, N. Y. and vicinity. The loss is estimated at about $100,000.

Boston, Mass.—The Bureau of Yards & Docks, Navy department, Washington, D. C., has revised plans for the erection of the proposed building at the South Boston Drydocks, estimated to cost about $200,000, with electrical and other machinery.

Cambridge, Mass.—The Cambridge Electric Light Co. placed an increase of about 25% in local lighting rates in effect Jan. 1, recently authorized by the Public Utilities department. The flat advance is 11%, plus a charge for coal burned by the company.

Palmer, Mass.—The Palmer Mills have had plans prepared for the erection of a one-story, reinforced concrete transformer station at their works, for increased electrical service. Lockwood, Green & Co., 245 State street, Boston, are engineers.

Albany, N. Y.—Challenging the authority and jurisdiction of the Federal Power commission, Attorney General Charles D. Newton has filed objections to applications made by twelve corporations and organizations to divert and utilize waters of the St. Lawrence and Niagara rivers for power service. This is the opening action of the state in its proposed plans to protect its water power rights.

Amsterdam, N. Y.—The Adirondack Power & Light Corp. has called a meeting of stockholders to approve an increase in capital stock from $13,800,000 to $23,100,000. A stock issue of $5,000,000 has been arranged. The financing is to provide for extensions and betterments, including the construction of a new generating plant.

Brooklyn, N. Y.—Electrical equipment, ice-making and refrigerating equipment will be installed in the ice-manufacturing plant to be erected by Rubel Bros., Glenmore avenue on Tilden avenue, between Flatbush and Bedford avenues. The plant, with machinery, is estimated to cost close to $500,000.

Endicott, N. Y.—The water department is arranging for the installation of electrically operated pumping equipment at the municipal waterworks, to replace the present steam-driven apparatus. Service will be furnished by the Binghamton Light, Heat & Power Co.

Manlius, N. Y.—The common council has plans under way for the construction of a new electrically operated pumping plant in connection with the waterworks system, to cost about $25,000.

New York, N. Y.—The New York Edison Co., Fifteenth street and Irving place, will furnish service at the new Town hall, 113-23 West 43rd street. The installation will consist of 2500 lamps, with pumping, ventilating and other machinery requiring about 290 h. p. in motors.

New York, N. Y.—The New York Edison Co., Irving place and 15th street, will furnish service for the office building of the Munson Steamship Co., now in course of erection at Wall and Beaver streets. The installation will comprise a total of 3600 lamps and 400 h. p. in motors for the operation of elevators, pumps and other equipment.

New York, N. Y.—The Standard Oil Co. of New Jersey, 26 Broadway, will build a pumping station in the Tampico, Mex., oil fields, to comprise 12 large pumping units, a battery of 28 boilers, and auxiliary operating equipment. It is proposed to develop a capacity of about 200,000 barrels per day. The company will also construct two central power plants for service in the Amatlan and Zacamixtle fields.

New York, N. Y.—The United Electric Light & Power Co., 130 East 15th street, is completing foundation work for its proposed electric generating station at East River and 134th street, and proposes to commence the erection of the superstructure at an early date. The plant will comprise two buildings, and is estimated to cost about $3,000,000, including machinery. Contract for erection was awarded recently to the United States Structural Co., 841 Broadway.

Sharon Springs, N. Y.—The J. H. Gardner Estate has plans under way for the construction of a power house in connection with a building project in this section. Morrell Vrooman, 3 North Main street, Gloversville, N. Y., is engineer.

Watertown, N. Y.—Plans are under way for the development of the city power project. C. A. Bingham is city engineer.

Atlantic City, N. J.—The city council is having plans prepared for the construction of a central station for city electrical system, including police and fire alarm at Tennessee and Railroad avenues, to be two-story, 37 by 50 ft.

Bayonne, N. J.—Electrical and mechanical equipment will be installed in the ink manufacturing plant to be erected at West Second street and the Hudson county boulevard by J. M. Huber, 65 West Houston street, New York, at a cost of about $50,000. Excavation work has been commenced.

Cedarville, N. J.—The township committee is planning for the installation of a new electrically operated signal system for the fire department.

Hightstown, N. J.—The borough council has signed a contract with the Hightstown Light, Heat & Power Co., for municipal light and power service during the coming year.

Hightstown, N. J.—The water board will commence construction at once of the proposed pumping plant for the municipal waterworks. The installation will comprise electrically operated pumping machinery, replacing present steam-driven equipment. The plant will have a capacity of about 700,000 gals. per day, with source of supply from five artesian wells.

Lakehurst, N. J.—A series street lighting system will be installed by the Bureau of Yards & Docks, Navy department, Washington, D. C. in connection with the new aircraft works here. The work will comprise an underground duct system, and electrical distributing lines for service, as well as for general light and power supply. The street system will consist of lighting standards, fixtures, etc. At the main works, an electrically operated traveling platform will be constructed, and electric hoist installed.

Morris Plains, N. J.—The Hanover township committee has passed resolutions authorizing lighting districts at Hanover and Cedar Knolls, subject to the approval of the citizens of these sections. A new lighting district will also be established at Morris Plains.

Perth Amboy, N. J.—The board of aldermen has approved plans for the installation of a new "white way" lighting system on Madison avenue, from Market street to New Brunswick avenue. Service will be furnished by the municipal lighting plant. Jay B. Franke, city electrician is in charge.

Perth Amboy, N. J.—The board of water commissioners is planning for the installation of high level pumping equipment at the municipal waterworks, and for the construction of an extension to the Runyon pumping station.

Princeton, N. J.—Electrical and mechanical equipment will be installed in the proposed new sewerage disposal plant to be constructed by the local department of public works, estimated to cost about $30,000. Plans have been submitted to the state board of health for approval.

Allentown, Pa.—The Lehigh Valley Light & Power Co., has construction work under way on its steam-operated electric generating station at Hauto, Pa., estimated to cost about $5,000,000, including machinery. The company is operated by the Electric Bond & Share Co., 71 Broadway, New York, and the construction will be handled by the Phoenix Utility Co.,

same address, an affiliated organization.

Catasauqua, Pa.—The Pennsylvania Light & Power Co. is making improvements in the local street lighting system, including new lamps at street intersections.

Chester, Pa.—A number of local industrial companies, including the Sun Shipbuilding Co., Aberfoyle Mfg. Co., Addison Steel Products Co., Merchant Shipbuilding Co., Eagan-Rodgers Steel & Iron Co., and the Scott Paper Co., have filed a protest with the Public Service commission against the new rates of the Delaware County Electric Co. The petition sets forth that the increase is from 30 to 40%, and does not abolish the 10% war increase rate.

Harrisburg, Pa.—In connection with extensions and improvements in the local street-lighting system, the city electrical department has tests under way of different types of lamps. It is proposed to use 600-cp. incandescent lamps in place of a number of arc lights. A number of new lighting units will be installed during the coming year. The Harrisburg Light & Power Co. is completing the installation of conduits in the business section, and it is proposed to connect the underground system, and abandon the overhead lines, at the earliest possible date. City Electrician Clark E. Diehl is in charge of the local lighting system.

Harrisburg, Pa.—The city council has passed an ordinance authorizing the employment of Dr. William Lispenard Robb, head of the electrical department of the Rensellaer Polytechnic Institute, Troy, N. Y., to make an investigation for the city of the plant and system of the Harrisburg Light & Power Co., with view to making recommendations for adequate service. The work will be conducted under the direction of Commissioner Hassler.

Philadelphia, Pa. — The Philadelphia Electric Co., is making extensions and improvements in the building at Twenty-third and Market streets, formerly occupied by the Vim Motor Co., to be used as a central service station, and for general operating service.

Reading, Pa.—The Metropolitan Edison Co. has made application to the Public Service Commission for permission to issue bonds for $84,000, the proceeds to be used for general operations, extensions, improvements, etc.

Steelton, Pa.—The water department is planning for the installation of electrically operated centrifugal pumping equipment at the city waterworks, replacing present steam driven equipment, and a considerable part of which has been condemned by the state authorities. The improvement is estimated to cost about $40,000.

Wilkes-Barre, Pa. — Considerable electrical and mechanical equipment was destroyed in the fire, Jan. 10, which damaged the plant of the Planters' Nut & Chocolate Co., South State street, with total loss, including machinery, reported at close to $200,000.

Baltimore, Md. — The board of awards has approved plans for the erection of an addition to the power plant at the city jail, including improvements in the present station. Mayor William F. Broening is president of the board.

Baltimore, Md.—The department of lamps and lighting, John J. Hanson, superintendent, is planning for the installation of ornamental street lamps in certain sections of the city. A new installation of this character has just been made on Cathedral street, near Read street.

Baltimore, Md.—The Lafayette Mill & Lumber Co., Pulaski and Lafayette streets, has awarded a contract to J. J. O'Connor, Knickerbocker building, for the erection of a one-story power house at its works.

Hagerstown, Md. — The Antietam Light & Power Co., operating at Breathedsville, Boonsboro, Keedysville and Sharpsburg, has entered into agreement with the Hagerstown & Frederick Railway Co., for power supply. The Antietam Light & Power Co. will close down its steam-operated power plant on Antietam creek, near Breathedsville. The Hagerstown company will build a new high-tension line to a connection with the Antietam Light & Power Co.'s system on the Hagerstown-Sharpsburg turnpike, and furnish power at high voltage, to be stepped down by the purchasing company for distribution.

Cradock, Va.—The Cradock Utilities Co., recently organized, will operate a local electric light and power system. J. B. Ducan is president, and M. W. Jackson, secretary.

Petersburg, Va. — The Chesterfield Mfg. Co., operating a local cotton mill, has plans under way for the erection of a hydroelectric generating plant, to be used for industrial and other power and light service. It is estimated to cost about $75,000. J. F. Taylor is president.

Greer, S. C.—The board of public works is arranging plans for the construction of its proposed transmission line from Greer to Fairforest, to serve as a supply for service to the city, under 44,000-volt delivery. A substation and transformer station will be constructed for local distribution. J. B. Mendenhall is chairman of the board; W. N. Willis, Cleveland building, Spartansburg, S. C., is consulting engineer for the project.

Benson, N. C.—The city council has arranged for a bond issue of $30,000 for the installation of an electric lighting system.

NORTH CENTRAL STATES.

Zanesville, O. — Henry Stehmeter, of the central trades and labor council has asked the assistance of the city council in investigating the possibilities of the establishment of a municipal light and power plant. The cost is estimated at $50,000.

Blissfield, Mich. — Bonds in the sum of $30,000 have been voted for the purpose of enlarging and improving the municipal light plant.

Coldwater, Mich. — Bonds in the sum of $50,000 have been voted, for the purpose of increasing the capacity of the electric light and water plant.

Grand Rapids, Mich.—The city is contemplating the construction of a power plant at the government dam. E. A. Magnuson is village clerk.

Leroy, Mich.—Bonds in the sum of $5,000 have been issued to the Winterfield Light & Power Co. of Marion. The company is constructing a dam on the Claim river to light Marion, McBain, Evart, Tustin, Leroy, and Dighton.

Traverse City, Mich.—An election will be held in April to vote on the question of issuing $250,000 in bonds, for the construction of a hydroelectric plant on the Boardman river.

Wakefield, Mich. — The city commissioner has recommended electric lights along Tobin and O'Brien addition; improving lights in Verona location; 25 standards and cable on one side of Ascherman street and on one side of Brotherton street. Wm. Jackson is city clerk.

Frankfort, Ind.—The city has plans under way for the erection of a light plant, at an estimated cost of $500,000. The city clerk is in charge.

Champaign, Ill.—Engineer, F. C. Lohman, city hall, has prepared plans for a lighting system to cost about $80,000. S. C. Tucker is city clerk.

Danville, Ill.—The Danville Street Railway & Light Co. will issue $29,000 in bonds, under authority of the Illinois Public Utilities Commission.

Decatur, Ill. — The Illinois Public Utilities Commission has granted authority to the Decatur Railway & Light Co., to issue $108,000 5% mortgage gold bonds.

DeKalb, Ill.—Plans have been prepared for a boulevard lighting system, for lighting the normal grounds.

Sadorus, Ill.—Plans are under way for the installation of a new electric light system, and will be started on the plant in the near future.

Waukegan, Ill. — Plans are under way for the erection of a "white way" to cost $52,826. Theodore H. Durst is in charge.

Ashland, Wis.—Plans are being prepared for the erection of a "white way" on Second street. C. A. Lamoreux is in charge.

Milwaukee, Wis.—Plans are being prepared by Vaugh & Meyer, engineers, Security building, for an electric street lighting system, and for improving extension on Blue Mound road and Lovers Lane. The cost is estimated at $35,000. Geo. Hampel Co., is auditor.

Milaca, Minn. — Engineer J. D. Gray, has prepared plans for alterations to the municipal power plant. E. A. Magnuson is village clerk.

Fulton, Mo.—The city council has called a meeting for Jan. 21, to discuss the proposed bond issue of $75,000, for the purpose of improving and enlarging the city water and light plant.

Burlingame, Kans.—Black & Veatch, engineers, 703 Mutual building, Kansas City, have prepared plans for the erection of a municipal power plant.

SOUTH CENTRAL STATES.

Whitesburg, Ky.—W. C. Daniel & Son have completed plans for the erection of a one-story power plant.

Friendship, Tenn.—The light plant located on Main street was recently destroyed by fire. Mr. Cherry is mayor.

Wales, Tenn. — The International Agricultural Corp. will electrify its

local plant, with installation to include individual transformer station, motors, controllers, wiring, etc. Frakes Brothers, Columbia, Tenn., will handle a large part of the installation.

Jackson, Miss.—The city will construct, improve and make extensions to its electric railway, lighting plant, and electric and gas plants. W. A. Scott is manager.

Lexington, Miss. — The city has plans under way for the installation of an electric lighting system. J. D. Alsury is in charge.

Meridian, Miss.—An amendment has been made to the city's charter, giving the city authority to own and operate a municipal light and traction company.

Lake Charles, La.—The street and park department, E. S. Crosby, commissioner, is planning for the installation of a street-lighting system in certain sections of the city.

Arkadelphia, Ark. — The Arkansas Light & Power Co. is planning for extensions and improvements in its local electric system.

Higden, Ark.—The Arkansas Hydroelectric Development Co. has increased its capital stock from $500,000 to $3,000,000. Plans are under way to construct a plant on the Little Red river.

Bartlesville, Okla.—Plans are under way for the erection of a "white way" street lighting system. Nearly 75% of the business frontage has been signed in favor of the improvement by the Bartlesville Gas & Electric Co.

San Antonio, Tex.—The San Antonio Public Service Co. has been authorized to issue $2,300,000 additional capital stock, for extensions and betterments. W. B. Tuttle is vice-president.

WESTERN STATES.

Salt Lake City, Utah.—The Great Basin Power Co., Walker Bank building, has applied to the Federal Power Commission for a preliminary permit, for a dam and reservoir, on the north fork Duchense river.

Molson, Wash.—The Molson electric light and power plant was completely destroyed by fire. Steps will be taken immediately to rebuild. B. J. Rainey is proprietor.

PeEll, Wash.—The PeEll Light & Power Co. has been incorporated with a capital of $10,000. The company proposes to furnish light and power to the town of PeEll. C. E. McCoy is in charge.

Tacoma, Wash. — The municipal light department of Tacoma is planning some improvements and additions to the city's light and power system, to be constructed during 1921 over and beyond any progress that can be made towards the development of the Lake Cushman power site. The substation will be designed to transform 8000 or 10,000 kw. of power from high-tension lines for residential use, and will cost $100,000, including the extension of the high-tension line from the present main substation of the system.

Medford, Ore. — The Blue Ledge Mining Co. will construct an electrical power plant next spring to cost $50,000. Electrical power will be furnished to the other mine development in the district, and the new power plant will mean doubling the present capacity of the Blue Ledge mine.

Everett, Wash.—Mayor W. H. Clay, has applied to the Federal Power Commission for preliminary permit for a diversion dam and tunnel to carry 500 cu. ft. per sec. from Sultan river to Lake Chaplain, used as storage reservoir; 84 in. conduit from Lake Chaplain to power house on Sultan river, Washington.

Fortuna, Cal.—The Pacific Lumber Co. plans to erect a power plant and electrify its entire works, the installation to include a 2000-hp. generator.

Los Angeles, Cal.—The Los Angeles Gas & Electric Corp. plan to expend $5,000,000 on improvements. Champ Vance is general manager.

CANADA.

Montreal, Que. — The Montreal Light, Heat & Power Co., 83 Craig street, West, plans to erect an addition to its power house. Address M. Wilson, chief engineer.

PROPOSALS.

Bonhamtown, N. J.—The building committee of the Board of Education, Raritan township, will receive bids until 7:30 p. m., Feb. 17, for electrical work, heating and ventilating, etc., in a school building to be erected at Fords; also, in the addition to be constructed to the school at Piscataway. Alexander Merchant, 363 George street, New Brunswick, N. J., is architect. Charles Anderson is president of the board.

Gisborne, New Zealand.—Bids will be opened at the office of the Hydro-Electric Engineering Co., Ltd., March 31, for hydroelectric machinery for the Waikohu hydroelectric scheme near Gisborne. The electrical specifications cover two a-c. generators, each 2500 kv-a. 11,000 volts, 50 cycles, 500 r.p.m., and two 100-kw. 125-volt d-c. Pelton-driven exciters direct connected to two 100-kw. induction generators. The hydraulic specifications cover two 3600-hp. Pelton wheels directly connected to the above generators and operating at 500 r.p.m. under a net effective head of 640 to 680 ft., and the two 154-hp. Pelton wheels for the exciters.

INCORPORATIONS.

Newark, N. J.—Connecticut Dynamo & Motor Co. Capital, $150,000. To manufacture electrical machinery. Incorporators: Harry J. Brewer, Donald B. Munsick and Gerald Hannay, Lyons avenue and Woolsey street, Irvington, N. J.

New Brunswick, N. J.—Automatic Telephone Equipment Co. Capital, $100,000. To manufacture telephone apparatus and other electrical products. Incorporators: Oscar S. Bowen, Percy S. Hayden and Harold R. Fick, 116 Livingston avenue.

Jersey City, N. J.—Lynthan Electric Lamp Co. Capital, $150,000. To manufacture electric lamps and other kindred products. Incorporators: William J. Tompkins, John W. Aymar, Jr., and Waldemar F. Timme.

Philadelphia, Pa.—Philadelphia & Easton Electric Railroad Co. Capital, $100,000. To operate an electric railway system. Incorporators: D. W. Steel, Jr., Simon Oppenheimer and Benjamin P. Steel, New York City.

Buffalo, N. Y.—Instantaneous Electric Heater Corp. Capital, $500,000. To manufacture electric heaters. Incorporators: J. G. Herb, R. McLelland, A. E. Choate and others.

New York, N. Y.—Griffith Sales Co. Capital, $50,000. To manufacture electrical appliances, etc. Incorporators: J. H. Olsen, 1328 Broadway; F. W. Doty, F. J. Page and others.

Wilmington, Del.—Automatic Electric Heater Co. Capital, $600,000. Incorporators: S. L. Mackey, R. E. McCloskey, C. B. Cutten and others.

Moro, Ore.—Sherman Electric Co. Capital, $200,000. Incorporators: A. M. Wright, C. H. Howell, C. A. Buckley and others.

Canton, O. — State Electric Appliance & Construction Co. Capital, $25,000. Incorporators: L. M. Lusky, R. G. Vincent and others.

Cleveland, O.—A. B. S. Electric Co. Capital, $10,000. Incorporators: H. E. Barrow, L. T. Allen, C. D. Ainger, E. C. Smith and others.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electric Fans (34,289).—An electrical company in India desires to receive quotations from manufacturers of electric ceiling fans of 32, 48 and 56-in. size, with four wooden blades, to operate on 230 to 250 volts, direct current, and to have 3-ft. supporting rod with nickel-plated suspension fittings and canopy; also electric portable fans of 8, 12 and 16-in. sizes, with four or six polished brass blades, brass guard and three-speed self-contained regulator; and standard types of metallic-filament lamps, both vacuum and gas-filled types. Samples fans are desired.

Wilmington, Del.—Electrical Engineering Corp. Capital, $50,000. To engage as electrical engineers. Incorporators: L. A. Irwin, W. G. Singer and M. L. Rogers.

Electrical Specialties (34,299)—A mercantile company in Norway desires to secure an agency for the sale of electrical specialties. Quotations should be given c. i. f. Norwegian port. Payment to be made through banks in Norway and in New York. References.

Electrical Appliances (34,300)—A manufacturing company in Scotland desires to secure an agency for the sale of articles, materials and appliances used by contractors in the electrical trades, etc., preferably those which are standardized into a very few forms of types, so that stocks of a multiplicity of alternatives will not be required. Cash payments to be made. Quotations should be given c. i. f. Glasgow, Liverpool and London. Reference.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Offer of Northwestern Bell Telephone Co. Bonds.

J. P. Morgan & Co. are heading a syndicate which is offering for subscription $30,000,000 Northwestern Bell Telephone Co. first mortgage 20-year 7% bonds. The Northwestern Bell Telephone Co., the oldest of whose constituent properties has been in existence since 1883, operates as a part of the Bell system in the states of Iowa, Nebraska, Minnesota, South Dakota and North Dakota. The bonds, which will be dated Feb. 1, 1921, and will be due Feb. 1, 1941, will be secured by a first lien on the telephone plant of the company in the first four states mentioned. The company also agrees not to mortgage that portion of its plant which lies in North Dakota without securing, by a prior lien, the bonds issued under this first mortgage. All of the stock of the Northwestern Bell Telephone Co. is owned by the American Telephone & Telegraph Co.

Pacific Gas & Electric Co.

The Pacific Gas & Electric Co. reports for November an operating revenue of $3,048,941, compared with $2,291,106 for the corresponding month a year ago, and a surplus of $229,947, compared with $156,565 a year ago. For twelve months they report an operating revenue of $33,714,628, compared with $245,597,111 in 1919, and a surplus of $2,138,135, compared with $1,843,586 for the previous year.

Augusta-Aiken Railway & Electric Corp.

	1920.	1919.
November gross	$ 103,879	$ 112,065
Net after taxes	30,961	45,030
Deficit after charges	1,507	*14,531
Twelve months' gross	1,242,078	1,096,395
Net after taxes	422,076	354,864
Surplus after charges	29,923	†25,369

*Surplus. †Deficit.

Cities Service Co.

	1920.	1919.
November gross earnings	$1,942,230	$1,613,081
Net earnings	1,880,792	1,557,869
Interest on debentures	151,208	151,411
Preferred dividend	399,922	359,030
Net to stocks	1,729,584	1,406,458
Net to reserves, common stock and surplus	1,320,682	1,047,428

Cumberland County Power & Light Co.

	1920.	1919.
November gross	$ 261,046	$ 238,794
Net after taxes	79,431	106,736
Surplus after fixed charges	23,656	50,965
Twelve months' gross	3,090,578	2,792,342
Net after taxes	1,004,345	904,137
Surplus after fixed charges	336,989	213,984

Tampa Electric Co.

For November—	1920.	Increase.
Gross earnings	$ 128,997	$ 13,202
Net earnings	52,369	2,115
Surplus after charges	47,934	2,276
Twelve months ending Nov. 30—		
Gross earnings	1,454,352	207,095
Net earnings	556,282	61,873
Surplus after charges	503,605	64,063

Rutland Railway, Light & Power Co.

	1920.	1919.
November operating revenues	$51,269.75	$45,303.12
Operating expenses and taxes	44,999.23	32,039.78
Operating income	$ 6,270.52	$13,263.34
Amount of maintenance expenditures included in above operating expenses	$12,147.30	$ 7,997.16

The Northwestern Ohio Railway & Power Co.

	1920.	1919.
November operating revenues	$41,254.16	$26,599.06
Operating expenses and taxes	39,198.70	30,364.07
Operating income	$ 2,055.46	$ 3,765.01
Amount of maintenance expenditures included in above operating expenses	$ 8,506.73	$10,180.59

Sayre Electric Co.

	1920.	1919.
November operating revenues	$18,220.03	$12,710.76
Operating expenses, taxes and rentals	14,512.87	8,420.66
Operating income	$ 3,707.16	$ 4,290.10
Amount of maintenance expenditures included in above operating expenses	$ 888.06	$ 621.41

The Sandusky Gas & Electric Co.

	1920.	1919.
November operating revenues	$85,505.91	$62,466.04
Operating expenses and taxes	70,523.61	53,489.18
Operating income	$14,982.30	$ 8,976.86
Amount of maintenance expenditures included in above operating expenses	$ 1,536.23	$ 3,322.11

Vermont Hydro-Electric Corp.

	1920.	1919.
November operating revenues	$52,891.88	$45,176.52
Operating expenses, taxes and rentals	37,430.58	26,637.96
Operating income	$15,461.30	$18,538.56
Amount of maintenance expenditures included in above operating expenses	$ 8,343.13	$ 1,276.98

Pennsylvania Utilities System.

	1920.	1919.
November operating revenues	$254,073.61	$162,990.87
Operating expenses, taxes and rentals	189,415.32	114,703.32
Operating income	$ 64,658.29	$ 48,287.55
Amount of maintenance expenditures included in above operating expenses	$ 38,942.76	$ 22,618.37

Metropolitan Edison Co.

	1920.	1919.
November operating revenues	$264,018.16	$212,768.74
Operating expenses, taxes and rentals	195,119.89	121,166.84
Operating income	$ 68,898.27	$ 91,601.90
Amount of maintenance expenditures included in above operating expenses	$ 33,009.93	$ 15,269.28

Pacific Gas & Electric Co.

	1920.	1919.
November gross	$3,048,941	$2,291,106
Net earnings	672,031	577,640
Total income	768,614	628,624
Surplus after charges	229,947	156,565
Eleven months' gross	31,242,705	23,466,448
Net earnings	8,395,973	7,367,299
Total income	9,213,607	7,957,370
Surplus after charges	3,521,822	2,946,086

Dividends.

	Term.	Rate.	Payable.
Am. W. Wks. & El. pf.	Q.	1.75%	Feb. 15
Cities Serv. pf.	Mo.	0.5%	Mar. 1
Cities Serv. pf. "B"	Mo.	0.5%	Mar. 1
Cities Serv. com. stk.		1.25%	Mar. 1
Cities Serv. com.	Mo.	.5%	Mar. 1
Col. Gas. & El.	Q.	$1.50	Feb. 15
C'wealth P. R. & L. pf script	Q.	1.5%	Feb. 1
Dallas Pr. & Lt. pf.	Q.	1.75%	Feb. 1
Idaho Pr. pf.	Q.	1.75%	Feb. 1
Kellogg Sw. & Sup. stk.		10%	Jan. 31
Kellogg Sw. & Sup.	Q.	2%	Feb. 9
Pacific G. & El. pf.	Q.	$1.50	Feb. 15
Pacific Pr. & Lt. pf.	Q.	1.75%	Feb. 1
Rwy. & Lt. Sec. com.	Sa.	$3.00	Feb. 1
Rwy. & Lt. Sec. pf.	Sa.	$3.00	Feb. 1

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Jan. 18.	Bid Jan. 25.
Adirondack Electric Power of Glens Falls, common	6	13	14
Adirondack Electric Power of Glens Falls, preferred	6	71	72
American Gas & Electric of New York, common	..	94	95
American Gas & Electric of New York, preferred	6	36	36
American Light & Traction of New York, common	..	79	82
American Light & Traction of New York, preferred	6	74	75
American Power & Light of New York, common	4	42	42
American Power & Light of New York, preferred	6	62	61
American Public Utilities of Grand Rapids, common	..	8	9
American Public Utilities of Grand Rapids, preferred	7	18	19
American Telephone & Telegraph of New York	..	102	103
American Water Works & Elec. of New York, common	..	2	2
American Water Works & Elec. of New York, particip	7	4½	4½
American Water Works & Elec. of New York, 1st preferred	..	41	40
Appalachian Power, common	..	2	3
Appalachian Power, preferred	7	17	18
Cities Service of New York, common	+extra	243	257
Cities Service of New York, preferred	6	65	65
Commonwealth Edison of Chicago	8	102	104
Comm. Power, Railway & Light of Jackson, common	..	14	14
Comm. Power, Railway & Light of Jackson, preferred	6	34	35
Federal Light & Traction of New York, common	..	6	6½
Federal Light & Traction of New York, preferred	..	42	43
Northern States Power of Chicago, common	..	38	41
Northern States Power of Chicago, preferred	ex.div.7	78	79
Pacific Gas & Electric of San Francisco, common	..	48	47
Public Service of Northern Illinois, Chicago, common	7	58	57
Public Service of Northern Illinois, Chicago, preferred	6	72	73
Standard Gas & Electric of Chicago, common	..	12	12
Standard Gas & Electric of Chicago, preferred	8	34	34
Tennessee Railway, Light & Power of Chattanooga, common	..	1	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	1½	4
Western Power of San Francisco, common	..	20	21
Western Union Telegraph of New York	extra	80	81
Industrials—			
Electric Storage Battery of Philadelphia, common	4	98	99
General Electric of Schenectady	8	115	112
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42	43